CHILDREN'S DISEASES
FOR NURSES

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CHILDREN'S DISEASES FOR NURSES

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TO ALL NURSES WHO GUARD FOR LITTLE CHILDREN

"THE LAND OF COUNTERPANE"

"For the long nights you lay awake
And watched for my unworthy sake:
For your most comfortable hand
That led me through the uneven land:
For all the story books you read:
For all the pains you comforted:
For all you pitied, all you bore
In sad and happy days of yore:

* * *

From the sick child now well and old
Take, nurse, the little book you hold."

From Robert Louis Stevenson's
"To Alison Cunningham from Her Boy,"
In the Child's Garden of Verse.

PREFACE

The writing of this book has grown out of the request from many nurses to whom I have lectured, to have the lectures put into permanent form, and their interest in and appreciation of the subject led me to this task. But back of all that, my interest in lecturing to nurses is based upon my early hospital experiences. As an interne in the old Charity Hospital in Cleveland, Ohio, I came into contact with a trained group of Catholic Sisters whose devotion, patience, gentleness, and skill in handling a sick child taught me more than I could ever estimate. These Sisters in charge of the wards were all trained nurses with unsurpassed skill and technique combined with a spirit of love and understanding of little children that I can never forget. To Sister Irene and many others at the Charity Hospital, I wish to acknowledge my great indebtedness as a children's physician. Later, in the Children's Hospital, Boston, I found in Sister Susanne, of an Episcopal Sisterhood, St. Margaret's, the same splendid devotion and marvelous skill in handling sick children.

To Miss Ida C. Smith, the superintendent of the Children's Hospital, Boston; to Miss Greta Mabry, for years the head nurse of the Infants' Asylum, Jamaica Plains, Boston, and to many other nurses, I owe the desire to make, if possible, a contribution to the nurses' profession in some measure commensurate with the contribution all these nurses have made to my own profession.

In the writing of this book I desire to acknowledge my great indebtedness to Miss Harriet Leete, National Field Director of the American Child Health Association, for critical reading of the manuscript and many valuable suggestions; to Miss Mary May Pickering, Director of the Nursing School of the University of California Hospital; to Miss Mary S. Power, Assistant Director of the Nursing School of the University of California Hospital; to Miss M. Louise Justus, Instructor of Nurses in the San Francisco Hospital, for their painstaking study and constructive criticism of the manuscript; to Miss Katharine Vail, Dietitian of the University of California Hospital, for the arrangement of the dietaries and recipes; to Miss Alice H. Ralston, Instructor in the Nursing School of the University of California Hospital, and Miss Sara Bloom, for many years a very successful head nurse in my wards, for their special help in the methods of

Procedures; to Miss Jessie Bell, my secretary, for her untiring work and infinite patience in collecting the material.

The completion of the book has been made possible by the inspiration and devoted help of my dear wife, June Richardson Lucas.

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NOTE

The references following each chapter are to the standard textbooks in pediatrics, to special monographs and to articles in the current medical and popular periodicals, especially those devoted to children's diseases and child welfare. These references are intended for nurses who are interested in the subject under discussion and who wish additional information.

The magazines the nurse will find most helpful for this purpose are the *American Journal of the Diseases of Children* (*Am. J. Dis. Child.*) published by the American Medical Association, the *Archives of Pediatrics* (*Arch. Pediat.*) published by E. B. Treat Co., and *Mother and Child* published by the American Child Health Association. There are also references to articles in the *Journal of the American Medical Association* (*J. A. M. A.*), *Boston Medical and Surgical Journal* (*Boston M. & S. J.*), *Medical Clinics of North America* (*M. Clinics N. America*) and a number of other journals published in the United States as well as to a few British medical journals. Magazine articles will be found to refer to some particular phase of the subject, while the textbook references usually cover the subject as a whole.

No attempt has been made to compile an exhaustive bibliography but rather to give suggestive references to stimulate interest in the subject. I know of no better way to develop an intelligent understanding of the disease conditions of infancy and childhood and to keep abreast of modern medical thought along these lines than to devote some spare time to reading current articles in the standard medical journals.

Further references may be found in the Quarterly Cumulative Index published by the American Medical Association arranged alphabetically by subject and author and in the Index Medicus, published quarterly by the Carnegie Institution, Washington, D. C. One or more of the standard pediatric textbooks will be found in almost every hospital as well as several of the medical magazines.

The abbreviations used in these bibliographies are those of the Cumulative Index. For example: Marcus, J. H., Weaning the Infant, *New York M. J.* 116: 101, July 19, '22, if written in full would be Joseph H. Marcus, Weaning the Infant, *New York*

Medical Journal, volume 116, page 101, July 19, 1922. In every bibliography, the standard textbooks, in alphabetical order by author are quoted first, followed by periodical references also arranged alphabetically by author.

Procedure References. By the time a nurse comes to her special training in nursing diseases of children, she has had her elementary course in procedures. Every hospital and every head nurse have their own particular way of teaching these procedures. Therefore I have referred to Harmer's, "The Principles and Practice of Nursing," for almost all general procedures. Wherever there are special procedures for the care of babies and children, I have given them in the text. Even here hospital technic varies so that I have not dwelt upon the details of such procedures but upon the general principles.

INTRODUCTION

Introductory Backgrounds. No mere man and he a doctor would be wise in undertaking to trace the history of nursing. The profession of nursing is all tangled up with the profession of medicine from the earliest history of primitive man, and a doctor might be prone to blame the unpleasant chapters in the history of medicine upon the nursing of the period as the easiest way of explaining the gaps in the development of his own profession! Besides, the great nurses of history have left their own splendid records of the profession of nursing, and Miss Nutting and Miss Dock, inspiring leaders of modern nursing, have put into four exhaustive volumes the accumulative evidence of the steady progress of nursing from earliest recorded data to the last moving chapter, the Great War. Nor is it my intention to prove that Eve was the first pediatric nurse and that a sort of "apostolic succession" of children's nurses have streamed across the pages of history since the Garden of Eden story! The interpretive powers of eager historians are great and original but when one undertakes to force one's own particular modern hobby back into antiquity, one must be prepared to meet the consequences—that of discovering that what one thought of as new, is a trifle out of date! History gives the pediatrician a goodly number of jolts.

The sacred books of India discussed the diseases of children and advised strongly three modern slogans for children, "Daily bath, daily bowel movements, daily cleansing of the teeth!"

Soranus of Ephesus, a wonderful physician of the years 110 and 130 A. D., wrote a splendid "Baby Book" that, with some editing, some additions of knowledge due to modern antiseptics, could easily be used to-day in educating the doctor, nurse, and mother. Soranus was a strong believer in wet nurses, first, because the wet nurse saved the mother for future child-bearing, and second, it also saved her beauty. Slaves were most frequently used for this purpose and he thinks it is the most expedient method. He must have had a very wealthy class of patients, as he advises not one wet nurse but two or three in case one should be taken ill. He gives explicit directions as to the kind of woman to be selected for a wet nurse and how she should qualify physically and mentally. "The essential mental

qualities of a good nurse, he says, are patience, common sense, good nature, gentleness and neatness."

Soranus gives several methods for testing the quality of the nurse's milk. Do not judge the milk by a poor appearance of the infant, he says, for the milk may be of the best, and the infant have some disease which prevents proper nutrition. The quality of the milk can be tested by its proper color, its odor and its consistency. Its density is established by mixing it with water and observing its behavior. He describes the taste of normal human milk and how it should act when exposed to the air. Its behavior when shaken, and the appearance and persistence of air bubbles, furnishes another index to its density. Also when a drop of milk is placed on the finger nail, it should not run off quickly nor change its shape when the finger is shaken moderately, but it should do so when the hand is shaken rapidly. If milk proves satisfactory under these tests, even though the mother is not on a proper diet, it is very good milk, says Soranus. To increase the quality and quantity of milk, he advises the careful examination of the nurse, to see if any disease is present. If none is discovered, then her milk may be improved by eating concentrated foods, such as eggs, goat's milk, flour meal and drinking less water. To improve her general condition, he recommends light exercise, singing, discus-throwing, deep breathing and massage. He says all medicines and popular remedies used to increase the quality of milk produce injury in the stomach and cause indigestion in the nurse. To correct too rich milk, or what he calls heavy milk, he prescribes baths, lighter foods and more water. His tests and advice may seem crude but they show that he was a careful and reasonable observer.

He prescribes a rational diet and special exercise for the mother. He warns against the excessive use of wine, and dissipation, as well as the effects of indigestion on the quality of the milk. He has a chapter on the technique of breast-feeding. "Feeding at irregular intervals and often during the day and especially during the night may be cause of sickness in infants," says Soranus. He thinks the infant should never be nursed to satiation, nor should the nurse sleep with the infant nor allow the infant to sleep while at the breast. He believes that moderate crying is helpful to the infant as a means of exercise. Crying, he writes, is not always caused by hunger. It may be caused by an inconvenient position, pressure of the clothing, irritation of the skin, too much food, excessive heat, colic and various diseases. He then tells in great detail how to differentiate between the various causes. The baby should not be moved or swung after feeding or there will be vomiting; and if the baby cries

after feeding do not threaten or yell at it; caress it, amuse it. Fear is bad for infants, and this is still good psychology.

He warns against the premature use of starchy foods. "Nothing but milk should be given up to the sixth month," he writes. First honey is allowed, later barley soup, then gruel, some parched grain, last of all, eggs. The change to more solid foods is permissible at one and one-half to two years.

Fat infants, according to Soranus, should be given less food and thin ones more nourishing food. He described the rational methods of curbing the tendency of some children to overeat and of inducing others with poor appetites to eat more food. He gives such wholesome advice as that, if an infant becomes ill during weaning, the weaning process should be discontinued at once and the child put back on the breast. Regarding the eruption of teeth, he thinks that the gums should not be pressed nor bruised. Nineteen centuries ago a wise doctor was giving careful thought and care to the baby. Why, no one even caught up with Soranus until the eighteenth century!

When France and Spain were Roman colonies, the nursing bottle was already rivalling the high cost of wet nursing or the inconvenience of maternal nursing. These nursing bottles are found in the tombs of children who didn't survive the ancient pediatrician's feeding formulas! Long before the nursing bottle appeared, large covered spoons with narrow pointed ends were used to feed the baby thick starchy gruels. The poor had pewter ones, the rich used silver and gold, so that the kind of a spoon a child had in his mouth did indeed determine his social status.

Wisdom is not confined to any age, country, race or profession, and historical spectacles worn solely to prove fallacies, or to mark appalling differences of procedure between then and now, destroy, in the end, our true vision. The continuity of motive, if one may so describe it, is to my mind the great inspiration the study of the history of medicine and nursing has for us doctors and nurses. We find the different stages and periods in these two professions clearly marked. Great heroes stand out boldly against the background of history; great changes in the standards are marked by new movements, new discoveries, political revolutions change even hospital methods, and wars always brought new opportunities. We are sure of one thing as we read the long record from primitive times until to-day, with its "dark ages," its brutalities conscious and unconscious, that the reason our professions persisted was because of the deep underlying motive—service to mankind. That motive has, I believe, been the strong bridge between the various periods in human development.

Nursing is as old as life itself. Human care of humankind must always have existed or there would be no "Outlines of History." Protection is vital to the persistence of all life and nursing was the earliest effort to protect human life. Long before the Christian Era, care of the little children, the sick, the old, the insane, mark the most ancient of records. To stumble upon a medicine chest of a Pharaoh's Queen in a modern Berlin Museum is a unifying experience; 2500 B. C. seems but yesterday because of the service to man typified in the old alabaster flasks and the piece of linen cloth. You are sure the little sons of Pharaoh had many a bruised finger wrapped up by the Queen Mother and that the interest of those far-off children in that chest of old was just as keen as the interest of the children of to-day in the modern chest, built in the bathroom wall too high up for small hands to reach.

The ancient Hindoo demanded much of a nurse. "She must have knowledge of drugs, their preparation and composition. She must be clever. She must give devotion to her patients and bring to her task purity of mind and body." Miss Nightingale might have written those requirements. The beautiful hospitals of ancient Greece must have had their nursing staffs. Later in ancient Rome, militaristic as she was, her hospitals and care of the sick were part of her life because of her constantly growing number of wounded legionaires!

With the coming of the Christian Era, the nurse comes more clearly into the sunlight. History begins to record the good works of women with a deeper motive in their service, ardent followers of the Christian Church. I suppose the first nurse who ever received any lasting publicity was St. Paul's visiting nurse, Phœbe, in the first century. The efforts of the early Christians to live a community life emphasized the task of caring for the sick, or old, or those possessed of evil spirits, and surely the little children. It must have been a little deeper note introduced into life, that of caring for the sick because you loved them, and had been taught by the Great Physician, who had lived and preached and died, to treat all men as brothers. We read of poor women and of rich women giving this service to the communities, or on the roads frequented by pilgrims journeying to sacred places, and asking no reward except more service. This ideal persisted in spite of the fact that many considered the founder of it but

> "A learned leech
> Perished in a tumult many years ago
> Accused, our learning's fate—of wizardry, . . .
> His death, which happened when the Earthquake fell . . .
> Was wrought by the mad people—that's their wont!"

The fifth century marks the founding of many religious nursing orders—not that the members of the sisterhoods were bound by any vows or wore any particular dress. The sisters of St. Elizabeth, of St. Catherine, the Grey Sisters, the Black Sisters, and like orders were all more or less free nursing groups based on a spiritual conception of and desire for service. Then slowly the Church, gaining in political power, gained control over them. Perhaps the old Belgian order of Bequines of the seventh century are the only ones who remained from then until now outside the control of the clergy doing both hospital and private nursing. From Cæsar to Kaiser these women have nursed Belgium through her tragedies, fed her starving children, comforted the sorrowing women. How welcome they were during those dark days of the five years agony of Belgium in every feeding station and health center, every debilitated children's clinic and bread line—for quiet merciful errands to the proud sick and poor!

With the monasticism of the later centuries, nursing brotherhoods for the care of sick men were founded and men and women worked together for the sick men and women in the hospitals. The Pilgrims and the gallant Crusaders for nearly two hundred years made hospitals necessary along every great highway in Europe and special nursing orders including thousands of monks and nuns were founded—Knight Templars, Knights of St. John, Sisters of Mercy, Sisters of Charity, all glowing with the ardor of romantic adventure. The long, long history of nursing service following as it does the rise and fall of wars, of economic conditions, of religious contentions, can only be mentioned here from the angle of motive for that service. Whether it was because the belief held that the only way to save one's soul was by serving others, or whether it was the fashion to be known by one's good works, the nurse had to care about the work to succeed then as now. Perhaps the 1,200 years continuous service rendered by the Augustinian Sisters at the Hôtel Dieu of Paris is the most striking illustration of the driving force contained in simply caring for one's work for the work's sake. I should think every nurse to-day would be thrilled by that story—centuries of labor under all sorts of conditions—bossed by the Clergy who interfered with their work; overworked, underfed, no instruction given, foul conditions of hospital and patients and yet 1,200 years of unbroken service! You would have supposed that after one generation of such work under such conditions there would be no one to follow after. What must have been the restraint of those nurses in talking of their hardships with the young beginners!

Every country has its story of the hardships of the periods paralleled by the great achievements of the women leaders:

Catherine of Siena, for thirty-four years a nurse and teacher of Italy's Thirteenth Century; the Abbess Hilda at Whitby, England, with her great school and her own medical writings. One finds the legends of her seventh century influence still told about the picturesque ruins of the old abbey high on the cliff above the red-tiled roofs of the little town, famous now for the manufacture of jet ornaments and herring fishing! Before the late war, there was an old man still living close to the West Pier who would tell you that when epidemics of disease threatened the town, he had seen the ghost of Abbess Hilda gliding back and forth across the river bridge that unites this little town spread on both banks of the river!

The Middle Ages saw also the building of great civil hospitals, beautiful, as one may still see to-day in Rome, Florence, Lyons, London and other great cities, but they were nursed by lay people without any religious motive for their service and the conditions were far worse than in those hospitals nursed by the sisterhoods. Nursing became a menial service, and with the passing of years and the coming of the Reformation and the suppression of the church orders and sisterhoods, nursing lost, for a time, much of its finer motives of service and sacrifice for the sake of those suffering and in need, not the *only* profession that was hurt by the rush of material ideals into what had been founded upon spiritual conceptions of service!

It is good to remember that all this nursing history must have constantly included the care of little children. That lovely old Renaissance façade of the first Children's Hospital known to us never fails to charm as you cross the sunny Piazza dell' Annuziata in old Florence and catch the smile of the little bambinos in swaddling clothes between the arches of the old wall, the famous medallions of Andre della Robbia. This foundling hospital was begun in 1419 and completed in 1451, at the expense, not of a single generous benefactor, but of a Guild of Silk Weavers who probably found it annoying to have abandoned babies left on their door steps, especially when they were dark-eyed and chubby and appealing. So the "ospedale Santa Maria degli Innocentti" stands close to the old church of the same name and bambinos are ever in the sunny courtyard as well as on the wall above you.

There were other hospitals, of course, where a basket was kept in an unobserved alcove into which abandoned infants could be dropped. The Hôtel Dieu in Lyon, France, founded in 542, always has made such provisions, and one dark, rainy night during the winter of 1918, I saw a tiny bundle passed quickly through the small sliding partition in the great door of that hospital and

only a dark shadow remained as a background for the little life passed into the quiet hands of the Sisters to be raised with government aid.

The seventeenth and eighteenth centuries saw the establishment of countless foundling asylums which were in reality hospitals in a large measure where the high mortality rate must have been appalling. Human life was cheap and infant life cheapest of all, and if the mortality was high in institutions where conditions were better than in private homes, what must have been the "Slaughter of the Innocents"! Not until 1538 was there any attempt made to estimate the loss. Then, during the reign of Henry the Eighth, England ordered that the minister of every parish keep a true and exact register of all christenings, weddings and deaths. Queen Elizabeth issued a like order but it was long before anything like complete records were kept. Little Switzerland set the modern example of valuing her infant life and since 1549 that country has fairly complete vital statistics. In 1812 England passed a law giving the form of registration for all deaths, "bills of mortality," making one liable to fine who did not comply. These bills of mortality began quickly to tell the story.

Justin McCarthy in his "History of the Four Georges," speaks of Queen Anne as having no living children at the time of her death in 1714. She had borne her husband eighteen or nineteen children but most of them died in infancy, only one, the Duke of Gloucester, reaching his eleventh year. If such a thing were possible in royal families, what must have been the condition throughout the countryside with its sick and miserable at every cross roads!

Edward Gibbon, the historian, born in 1737, says in his "Memoirs" that he was succeeded by five brothers and one sister, all of whom were snatched away in their infancy. "The death of a newborn child before that of its parents may seem an unnatural, but it is a strictly probable, event, since of any given number born, the greater number are extinguished before their ninth year. Without accusing the profuse waste or imperfect workmanship of nature, I shall only observe that this chance was multiplied against my infant existence." He goes on to state that so feeble was his constitution that in the baptism of each of his five brothers, his father's prudence successfully repeated his Christian name of Edward, that, in the case of the death of the eldest son, this name might still be perpetuated in the family.

Old England and New England gravestones of the period tell the same story. But when we consider the condition of medical

science and the nursing of that time, the ignorance regarding public and private hygiene and sanitation and the consequent ravages of infectious diseases, we need not be surprised. The hospitals were filled with ignorant doctors and ignorant slovenly nurses. Nursing had fallen from devout hands into degraded hands. The motive to serve still existed but upon a much lower level. The devotion of nursing sisterhoods has always, in a measure, made up for lack of training and technique. The devout sister whose stern sense of duty made neglect of a sick patient impossible, unconsciously trained the other sisters in keen observation of symptoms, and few cases died of neglect. What she knew she administered faithfully, and undoubtedly countless lives were saved by devotion rather than skill. When the devotion was lacking and the skill was lacking, the combination of ignorant doctor and ignorant nurse provided high mortality statistics. In the Lying-in Hospital in Dublin from 1781 to 1785, it is said that 16.5 per cent of infants born, died before they were two weeks old. This was reduced to 4 per cent within a few years by the elimination of tetanus of the newborn to which more than nine-tenths of the deaths were due. This was accomplished principally by opening windows and cleaning up rooms and beds.

Percival, writing in 1789, states that in Manchester, England, half the children born died before reaching the fifth year, and a French medical writer in 1780 makes the statement that in France half the children born died before the end of the second year. It is a conservative estimate that in the latter part of the eighteenth century, infant mortality was over one-fourth of the total mortality and the mortality under five years of age was over half the total mortality. No one was surprised and few commented upon this condition. It was considered unfortunate but inevitable.

Then a new spark set a new fire burning and, as always, some ignorant underbrush got burned up, whole forests of prejudice and superstition were levelled to the earth. Democracy lifted its head above the smoke of the French Revolution, and men and women dared to discuss the value of human life. Philosophers blamed the doctors—doctors blamed the nurses. Black, writing in 1782, said that "up to this century the management of these tender creatures (babies!) in sickness was left to ignorant old nurses and rude quackery." William Cadogan, of the London Foundling Hospital, in 1749 writes that "it is with great pleasure I see at last the preservation of children become the care of men of sense; the public will soon find the good and great effects of it. Children have been left too long to the superstitious

care of old women. What is needed is a philosophic knowledge of nature, to be acquired only by learned observation and experience."

Bunnell Davis published a small book in 1817, called "A Cursory Inquiry into Some of the Principal Causes of Mortality among Children, with a View to Assisting in Ameliorating the State of the Rising Generation in Health, Morals, and Happiness." This little book showed careful study of the conditions and a clear grasp of the principles to be applied, if conditions were to be remedied. Of course, Davis was not popular, and he met much opposition but he succeeded in establishing in 1816 the only public dispensary for children. He made the first attempt to organize voluntary social workers in connection with his children's dispensary. He says, "If benevolent ladies could be prevailed upon to form district committees to visit and inspect the health of sick indigent children, much practical good would result from a medical and moral point of view. By such visitations as these it may be predicted that the instances of mortality among children will be quickly diminished; at the same time such benevolent females correct the absurd notions and errors of the poor as to the domestic management of their children." "Men of sense" they certainly were, ready to translate their "views" into action, and the most sensible of them realized that the man of sense in a hospital, in public health movements, would not get very far without the trained woman to help.

The earliest attempt to establish education in nursing was the effort of Dr. Robert Gooch in England in 1825. He selected a group of women for their "good sense, industry, kindliness, and piety" to study nursing in the hospitals of Edinburgh and London. He must have been a thorough "man of sense," for his requirements were certainly comprehensive. "Let them, he says, be examined frequently as to what they have learned; let books be framed for them which are brief and technical; let the women thus educated be put two together in a cottage in some country district and villages would soon have reason to bless the hour they came." Here we can see the beginning of a training school of the modern day which is connected with the hospital, the beginning of nursing textbooks, examinations and the plan of district and rural nursing. How slow we have been!

But nursing, in 1825, had an arduous journey ahead to recapture its older finer motives of the spirit, and harness, as it were, the flame of devotion to the heavy cart-wheel of careful training, and we owe to Theodore Fliedner and his splendid wife in the little Rhine village of Kaiserswerth, this first renewal of the old emphasis in nursing, this bringing back to the nursing pro-

fession of its age-long spiritual motive and supplying that motive with the most effectual avenue of expression, a fine technical training. Frau Fliedner, the inspiration and life of this new venture, served all her life as the "Mother" of the Order of Deaconesses trained at Kaiserswerth and her journal which she kept so faithfully, in spite of heart- and back-breaking burdens, give the nursing profession their first notes on formal nursing education by a woman. This training school on the Rhine became the incentive for such women as Elizabeth Fry, who went there to study in 1840, and of Florence Nightingale, who studied for four months at Kaiserswerth in 1851, realizing that there she had found the best nurses' training to be had anywhere and with her brilliant discerning eye, quick to correct and improve methods. The Deaconesses of Kaiserswerth were just as devout as the Augustinian Sisters but they took their orders from the doctors and not from the clergy with the result that bodies as well as souls were efficiently helped. Florence Nightingale grasped all the essentials of that training in the little Rhine village and in her own contribution to modern education of nurses freed the practical training from religious control and gave breadth and depth to the whole service. I often think that Miss Nightingale's greatest contribution to nursing was just *herself*. Her leadership, coming as it did when the character of the nurse was not of high order, when through neglect of training there had been no incentive for fine women to enter the work, was of inestimable value because of her fine breeding, her brilliant mind, her background of intelligent home-life. The story of her achievements should be the inspiration of every nurse in training but what she was in herself is even a greater contribution than what she accomplished.

Children's hospitals and children's wards in general hospitals in the natural evolution of the education of nurses offer the field of action for the specially trained children's nurse. Miss Nightingale's principle of "nursing the sick, not the sickness" makes a study of the sick child inevitable if nursing the child is to be successfully done. The demands of the sick baby or child upon a nurse are not those of a sick adult in many instances, and what to expect of the sick child, his moods, his humors, his tempers, his sorrows and his joys determine in great measure the success of the nurse in handling his sickness. Many good doctors can handle the "case"—many good doctors can handle the child; only the great ones can handle both the "case" and the child, and that's the measuring rod of all good nurses of children—they must handle the "case" and the child successfully!

Just this sort of "philosophical" dilemma brought Pediatrics

as a specialty into being; the realization that the incident of disease bears a particular relation to childhood as a whole. The care of the baby through the nursing months is really one of the oldest branches of medicine; but pediatrics, in its scientific development as a field, is one of the youngest branches. When the great democratic urge began to take hold upon modern life, and interest in how many children were born, how many died and how many lived, became a vital matter to great and small countries, the scientific relation of diseases to childhood followed as a logical outcome.

To "la belle France" goes the honor of the first hospital entirely devoted to the diseases of children. In 1802 in Paris, L'Hopital des Enfants Malade was established. In Vienna, Berlin, London, Moscow the work for children quickly spread as a particular field of medicine and with it the nursing care of children.

In the United States two names stand out prominently as pioneers in the opportunities offered to special nursing education. Dr. Abraham Jacobi of New York, the first teacher of diseases of children, organized the first weekly clinic for children in the New York Medical College in 1860 and through all his life in all his many hospital contacts and teaching gave special care to the training of the children's nurse. Dr. Thomas Morgan Rotch of Boston, who held the first chair of Pediatrics in Harvard Medical School, which was established in 1888, believed so firmly that the nursing requirements of infants differed widely from those of children that he founded the Infants Hospital in Boston, the first institution of the kind in the United States. One of the greatest educators of pediatric nurses in this country was for years the superintendent of nurses of the Children's Hospital in Boston, Sister Amy, of an Episcopal order, the Sisterhood of St. Margaret, whose fine spirit permeated every detail of a most vigorous training and who taught many an interne more about the diseases of children than he would ever have learned without her, and one of those fortunate internes would like to acknowledge his debt to Sister Amy here.

In almost every large city to-day nurses are being educated in hospitals limited to the diseases of infants and children and upon the success of that education depends the lives of countless little children. The disasters of war have, throughout history, been a great stimulus in the development of medicine and surgery as well as nursing. Wounded and sick men are a most stirring challenge to the doctors and nurses of all periods, and this last terrible holocaust of war has proved no exception. But the past fifty years emphasis upon the care and protection of the little child prepared us for the added challenge this last war flung

before us. Across the graves of 10,000,000 of the world's youth, stumbled the little frightened starving children of the world, the greatest sufferers of any war. The world knows that its future does not rest upon 10,000,000 memories however dear, or upon broken men however cleverly mended or successfully nursed back to life, but upon millions of children who must be developed into strong men and women. This great challenge comes to all of us whose special interest and skill is in the care of little children everywhere and it means new and greater efforts for the pediatrician, and more devoted and intelligent service for every nurse who cares for children sick or well. Like a flaming torch, this challenge falls across every little bed in the wards, across the laboratory table, across classroom desks and the endless pages of technical subjects, and we press on because we know, in the words of Stevenson—

> "Away down the River
>   A hundred miles or more
> Other little children
>   Shall bring my boats ashore."

PART I. INFANCY

CHAPTER I

FUNDAMENTAL PRINCIPLES IN PEDIATRIC NURSING

CHAPTER I

FUNDAMENTAL PRINCIPLES IN PEDIATRIC NURSING

INTRODUCTION. DIFFERENCES BETWEEN CHILD AND ADULT

The child is not merely a little man, although fashions of long ago made children look like small adults. Visits to old picture galleries make one feel the limitations of childhood in those days. The children look like adults in small sizes, as though one were looking at life through the large end of the telescope. I suppose Dame Fashion has ever had a direct effect upon the health and happiness of humans and little children did not escape. But time and study established the fact that "Clothes do not make a man" and children could not be treated as small adults, however much they were outwardly made to resemble them. There are likenesses, many of them, between child and adult, but there are many differences vital in content, and demanding different care. There are, therefore, certain differences between child and adult that are normal and the significance of which has guided much of our modern child care. Feldman works out with great care what we can but briefly indicate here. The most easily marked differences are perhaps *anatomical.* We can see that the structural differences in anatomy of child and adult have definite relations to other factors. The child's head is one-fourth the length of his body, so are his legs. His liver is relatively twice the size. The child's skull is not a hard box but is thin enough to feel bones and spaces and pulsations of the brain through the vault of the skull.

From the aspect of diseases, we know the child has his own pet diseases. Rickets occur only in childhood. Scurvy is very much modified in childhood. Rheumatism that in adults affects joints, in children and infants affects the heart. The physiological differences between child and adult are more subtle, more difficult often to define but positive in results. The normal child is growing constantly and with this growth must come many differences. The child's energy is not in any sense stable. The adult more or less settles down to a given pace—he can do just about so much if his life is kept at a certain level. The child's

levels of supply of energy change constantly with his growth and what he can do one year may be no indication of what he can do the next. Even the sick child is growing and the nurse is often surprised at the changes in the little patient's energy in the course of a long illness. We see the rapid recuperative powers of a child constantly. I remember the astonishment a small boy of seven gave his devoted family. He had tumbled from a high swing and neatly split his forehead open. Saturday morning saw him under anesthetic on the operating table for some deep stitching. The family arranged a quiet Sunday, expecting to sit by the small boy's bed in a darkened room and hold his hand while he recovered. "How his head will ache from a crack like that," they all said. Sunday morning found a pair of shining merry blue eyes looking out from a swollen face and bandaged head demanding the picnic that had been promised the week before! An adult would probably have ached all over for several days from such a fall. The small boy was ready and able to proceed with the usual activities. On the other hand this recuperative power is often abused and because of such instances as above given where the accident was surgical in its consequences, children are often expected to recover as quickly from disease and are often allowed to resume their normal life of activity too quickly. This is specially true after light attacks of infectious diseases. The recuperative powers of the young are indeed valuable assets in overcoming disease, but only if they are wisely guarded in order that they do not become a real menace to complete recovery.

Children need to be more warmly dressed than adults because the surface of a baby or child is relatively larger in proportion to its bulk than is the adult and, as Rubner demonstrated, the rate of cooling is proportioned to the surface. The child with the relatively large surface loses heat more rapidly. Therefore, the smaller the child the greater is the rate of loss. A child cannot, as a result, stand the exposure to cold that an adult can and this fact relates to the necessity of a food supply for the child of higher caloric content than that needed by an adult, to counterbalance the greater loss of heat.

The whole digestive processes of children and adults differ. A baby has no teeth—the food must be entirely liquid. As there is as yet no chewing of food, the salivary glands are not fully developed and certain starchy foods are more difficult to digest.

The more rapid circulation, the quicker pulse rate, the deep abdominal breathing of the baby are all normal differences from adult conditions, and have definite significance in the nursing care.

The laboratory has shown the difference in the character of the blood between child and adult; also certain organs and functions are different. The reproductive organs are in abeyance, while the thymus gland is active. Certain ducts exist in infancy only, and are not found in the adult, or are existent only in an atrophied condition. The whole chemical composition of the body changes with growth and the physiology of the child marks all these physical, chemical, structural and functional differences.

The mental and psychological differences between child and adult are to-day as tangible and as demonstrable as the physical differences. The various periods in infancy and childhood differ as widely in their psychological status as the whole period of childhood differs from the adult period.

All these differences we have discussed are *normal* and usual, and in themselves are the particular reason why the care of infants and children is a field quite distinct from the adult.

Fundamental Principles. The fundamental principles of nursing for babies and children are the same as those for adult nursing but the application of those principles differ as widely as the individual idiosyncrasies of all children and all adults differ. Every nurse knows how quickly and carefully she is called upon to apply her education. The sick adult gives her more time to get her training into action. The patient can help by his ability to discuss with the nurse how he feels, what he likes, what makes him comfortable or uncomfortable and unless desperately ill and unconscious or delirious can give to the nurse a certain amount of intelligent co-operation in his own care that makes it easier for the nurse to apply what she knows to be the best methods for the nursing care of that particular case. But in the nursing care of sick babies and children the nurse is often entirely dependent upon her keen powers of accurate observation and upon her ability to translate her training to meet the demands of the individual child, to handle the case successfully. The little baby cannot express his desires for water or food, or any uncomfortableness due to soiled diapers except by crying or extreme restlessness. Pain is indicated in the same way and many other symptoms must be entirely interpreted by the nurse. The little patient cannot express himself and the nurse must give constant and minute attention to the smallest, most insignificant detail, if her record of symptoms is to be accurate and trustworthy. These conditions are the same to a greater or lesser degree with the sickness of all children.

Special training and knowledge of children is important for the pediatric nurse, not only because of the inability of children to express their desires and to describe their feelings, but because

certain diseases are peculiar to early life, and other diseases common to adult life manifest different symptoms in the young or different degrees of seriousness than in the adult.

The great majority of serious illnesses in childhood are acute in character and in most of them the general management is very similar. To conserve the vitality of the patient and to build up the resistance of the patient, are what one might call the "background colors" for every nursing picture; two factors which have direct and constant effect upon the progress and outcome of the disease. The nurse who can bring real knowledge of child psychology, as well as perfect technique in child hygiene, to the task of nursing the sick child is better prepared to conserve the child's vitality in every possible way and in this way keep the child's resistance at the highest point. Such knowledge and understanding of the "crotchets" of little children lessen the chances of conflict and unhappiness for the nurse and patient. Time spent in winning a little patient's love and confidence is well spent, as crying spells, the fighting of necessary treatments all tend to weaken the child's vitality and may ultimately affect the very life itself. Every avenue of approach to the child should be utilized by the nurse and made the most of, and one should never forget that fathers and mothers are apt to have a pretty intimate knowledge of their own children! The family can often help to win the child for the nurse, by giving the knowledge of the patient's habits, and accustomed ways of handling him to the nurse in order that she may seem as friendly and familiar to the little patient as possible, and not waste her energy and his in useless conflict. One must always remember that the tiniest baby has already formed some living habits and these cannot be changed in a moment. It often takes time to establish the best regimen for the child but it is a rare case that will not yield to patience and gentleness. Even in the busy routine of a great hospital, the child must be won if the "case" is to be successfully handled. This does not mean "giving in to a spoiled child" or delaying the carrying out of the necessary measures for the care of the seriously acutely sick baby or child but it is a plea for a recognition of the fact that nursing the sick child is a particular art, requiring many wise choices and fine discriminations in applying one's nursing skill. It is seldom that an ideal routine can be perfectly carried out, and the test of the nurse's education lies in her ability to decide upon the absolutely *necessary* procedure and apply that to the case in hand as the goal is complete recovery from the acute illness, not the carrying out of every detail of an ideal procedure. Such power of adaptability on the part of a nurse is no indication of instability in her work or her

training but rather the wise application of common sense. The sick child has a mentality and a personality that must be handled as well as his sick body and in the nursing care of a sick child in an acute stage of a disease there is little opportunity for correcting his bad habits and educating the family. Mothers are not impressed by insistence upon a régime that very evidently makes the child more difficult to handle. The mother's confidence is always won by the nurse's ability "to get along with Mary," and when the acute condition has passed, the opportunity to suggest and carry out a reconstruction of habits and hygiene rests securely upon the confidence won by the initial tact and common sense of the nurse.

But certain general care is applicable to all sicknesses of children. Bed is the place for all sick babies and children with very few exceptions and holding and rocking the sick child should, if possible, be avoided. Babies with broncho-pneumonia are perhaps the most common exception to this general rule, as such babies seem to do better when held part of the time, and if they must be kept in bed, their positions should be frequently changed. As a rule all unnecessary handling of a sick child should be avoided, and whatever has to be done in the routine of care should be regularly attended to at as long intervals as possible. Trying to entertain or amuse a sick child should be most carefully considered as such procedure causes a certain amount of excitement and waste of energy, both of which results have a direct bearing upon the general progress of the disease. If the child is seriously ill one person at a time in the room is the best rule as every new face and voice make demands upon the little patient's strength. It is best to have, if possible, the same person relieve the nurse and that person should be the one with whom the child seems most quiet and content. Sometimes, we might say, usually, that person is the mother but we all have had instances where that was not the case, and where all the tact and skill possible are necessary to avoid hurting the one who cares the most, for the sake of the sick child. At such times, the wisest course for the nurse is to put the situation before the physician and let his "orders" be her best method of securing the necessary family co-operation. It is often difficult for a family to realize that the apparently well laughing baby of yesterday is a desperately sick child to-day, sensitive to things he never noticed when well, and to try to make him respond to the usual environment in any degree may cost him energy and vitality that may be sufficient to determine the issue.

On the other hand, the mother is often the greatest ally the nurse can have in the fight if she herself is calm and smiling and

helpful. Children watch grown-ups closely and are very much affected by the expressions of our faces. The very sick little child, conscious and in acute pain, or suffering from the discomfort and restlessness of high temperature, is often frightened, and the eager intense way in which the mother's or nurse's face is watched shows how he is looking for assuring smiles and the *usual* looks in those about him. Fear destroys the morale of all of us and the little child is no exception. A fine morale often wins the fight that seemed overwhelming. During the War, one saw this fact constantly demonstrated. The little French refugee children watched the faces of the grown-ups, and often children who had been laughing gaily would suddenly begin to cry bitterly because grandmother had buried her face in her hands and sobbed from sheer agony of spirit which the little children could not understand but which they felt.

So, in many ways, the usual way is the best for the very sick child. The clothing should be the usual night clothing he wears when well. To bundle him up because he is sick is not helping matters but only making him adjust himself to something different which takes strength from him. There is no illness that requires an excess of clothing, an over-heated room, and no baths, except in the case of feeble babies far below the normal. When convalescing and sitting up in bed, the child should have his undershirt on or an additional outer jacket over his nightgown in order to keep his body at an even temperance. It is the same with his bath. When sick, he needs particular care of his skin that it may help in throwing off the poisons and a sponge bath should be given once or twice daily for cleansing purposes regardless of the nature of the illness. For the bath, the room should be warm (80° F.) and the water about 90° F. for children over one year and 95° to 98° F. for young babies. Quickness and skill in handling is essential in bathing the sick child, not "hurry," which is apt to excite the patient.

Every sick child has a lessened digestive capacity, the degree depending upon the severity of the illness. The usual feeding should be decreased but the amount of fluid required is as great as before and in many instances greater. The patient will often control his diet himself by refusing food. Only as much food as the patient can digest easily should be allowed. Water should be given freely in any illness except a certain few involving the gastro-intestinal tract. Though a patient may be deprived of food for a time with benefit, there is a need for water at all times and if water cannot be given by mouth, other routes for the administration of fluids must be utilized. There are many physicians who leave the diet of the patient entirely to the

nurse. This is especially true in such conditions as chronic surgical diseases where a pediatrician is not called. Here the nurse, with a knowledge of child hygiene, is of great value as the successful treatment of chronic ailments depends upon the vitality and powers of resistance of the child. It is folly to expect a constructive process to be built upon a destructive diet and improper habits of life. These chronic conditions are difficult for the nurse because it is so easy for grown-ups to spoil the child who has such conditions to fight against.

The Sick-room. Perhaps the average sick-room in the average home is the most difficult problem for the nurse. To adapt her training in this to the conditions she meets requires often the skill and tact of angels! The fact that so many of the illnesses of childhood are infectious plus the fact that the general public has been more or less successfully educated to recognize this, enables the nurse to slowly adjust the room to meet the conditions of illness. A child ill in a dirty, badly ventilated, or over-furnished room is at a disadvantage from the first, and the nurse who finds such conditions must gently but firmly change them if possible. If it is not possible, then her next effort must be to make the best adaptation she can by keeping the patient and the space immediately surrounding the bed as clean and as free from cluttering, dust-collecting things as possible, and by the location of the bed gain as good ventilation as can be secured. The ideal sick room is a room with painted walls, no curtains, hangings or carpets, the simplest of wooden or enamel bed, tables and chairs, a fire place to aid in ventilation, a southern exposure in winter and a northern exposure for intense heat of summer. There are certain diseases in which cold air is a disadvantage but there is no disease in which fresh air is not essential. Even in very cold weather a window board may be so arranged as to give ventilation without causing cold drafts. It requires tact and courage to win the co-operation of the family in this matter of the sick-room, but this is usually won if the nurse bases all her changes upon what is best for the sick child.

Fever. Although any temperature above 99.5° F. (37.5° C.) is to be considered abnormal, slight elevations above this point may have no special significance. Children react much more readily than adults and may have fever from rather mild causes, such as nervous excitement, and usually have a higher temperature than adults from the same causes. Fever in a child may not be a reliable index of the gravity of the diseases. Much depends on the nature of the illness causing the fever. A temperature of 104° to 105° F. from an illness which is commonly of short duration, such as tonsillitis, usually requires no inter-

ference. With the same temperature in a patient with a more serious and protracted illness something may have to be done for the fever. The high temperature should be reduced if it causes irritability, restlessness and loss of sleep, because these are incompatible with rapid recovery. The presence or absence of these signs is more of a guide than the degree of the temperature in deciding whether or not to interfere.

Therapeutics for Children. Hydrotherapy is the most satisfactory method for combating fever. This is usually indicated when the temperature has reached 104° F. or over. The usual form of such treatment is the sponge or basin bath. Still another valuable method of using water as a means of reducing fever is by colon irrigations.

Drugs are used only among the ignorant when the family objects to other measures employed and demands a drug. The coal-tar products, phenacetin and antipyrin, are often used for this purpose. An effective and less harmful drug is "sweet spirits of niter." Drugs play a relatively small part in the treatment of disease in children. In most instances good nursing care is of more value than all the drugs in the pharmacopœia. Nursing care involves the general hygienic measures, such as diet and fresh air, the foreseeing and supplying of the child's needs and in certain instances the use of external applications and manipulations. Whatever drugs are used must be given in such a manner as not to interfere with the digestive tract. This may be accomplished by giving medicines after meals when possible. When given between meals they should be well diluted with water. Though drugs are ordered by the physician, the proper dosage should be known to the nurse in order to avoid mistakes. All of the drugs in common use are well borne by children when given in the proper dosage and dilution. These general principles underlie all the more detailed and special knowledge essential to the best nursing care of sick children.

The material here presented was first given to the nursing students in the University of California Hospital. I have gone into detail, taking up what seemed to me to be certain fundamental aspects of conditions and diseases peculiar to infancy and childhood. I have felt in my contact with nurses who have taken care of my patients, that often they lacked an appreciation of the special conditions involved, and were, therefore, handicapped in the aid they could offer in some difficult case. In pediatric nursing, to be successful the nurse must understand the condition from which the child is suffering in order to be most helpful, not in order that she may make a diagnosis, but that she may understand the processes which are developing or could develop in

the child during the course of the disease. Such knowledge enables the nurse to be in an intelligent state of preparedness. Her observation of symptoms is more keenly developed and often by anticipating possible developments she can do much to prevent the appearance of them. Nowhere is "little knowledge such a dangerous thing" as in the nursing care of infants and children. But nowhere is fine comprehensive knowledge more valuable.

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CHAPTER II

THE IMPORTANCE OF THE PRENATAL PERIOD AND THE POSTPARTUM CARE OF THE MOTHER

Good obstetrics is the beginning of all child welfare work or pediatrics. Until recently obstetrics dealt simply with the problems of the birth of the child. To-day good obstetrics commences with the care of the mother as soon as she knows she is pregnant. Prenatal care has had a very definite effect, not only on reducing infant mortality, but in giving the child to be born a much better chance of being healthy. Prenatal care demands an intelligent medical oversight of the future mother. This should include a complete medical examination early in her pregnancy to obtain an account of her general health, both physical and mental.

During the prenatal period there are not only difficult physical conditions which arise, but many mothers suffer from mental states due entirely to pregnancy. They have definite mental disturbances and they feel that certain impressions will have a harmful effect on their child. One can assure a mother that these fears have no basis of fact. It is known that there is no connection between the mother and the child in the uterus by which nervous impressions can be conveyed. Obstetricians are convinced that maternal impressions can never mark the child, for if this were possible most babies would be born marked. The harm which a mother may do her child in the uterus is not from this type of mental impressions, but rather is due to failure of the mother to so regulate her life that she will be in the best of health and keep herself in as happy a state of mind as possible for the child.

The child in the uterus is entirely dependent for its development upon the materials of nutrition which it obtains from the blood of the mother, so that it is probably only through nutrition that the mother is able to influence the child's future. The mother's condition of nutrition during pregnancy and lactation affects the quality of the child's teeth, as the temporary or deciduous teeth are developed and enameled before eruption, and these processes take place during the latter months of fetal life

and in the first months following birth. The entire bony structure of the child may be affected in this same way. If she takes plenty of sleep and exercise, eats sensibly of simple food and takes the best possible care of her body, she can be quite sure that the child will be able to build up a sound and normal body and brain. It is only when the mother neglects the plain rules of health and goes through her pregnancy unhappily lamenting the state she is in, giving little attention to her bodily functions, that the child may be robbed of some of the nutriment which it needs for its best development. The mother's diet during pregnancy, including the kind, the quality and the quantity of the food which she eats, is a most important consideration. The amount of exercise, the condition of her skin, the amount of fresh air she gets, all count in preparing her for a better motherhood. Undoubtedly, through the improper attitude and nutrition of the mother, many babies are born either prematurely or are delicate from the start and doubtless many infants' deaths in the first weeks and months of life may be traced to such causes.

During the prenatal period it is important to prevent eclampsia and nephritis. Both these conditions can be avoided by proper medical and nursing supervision during this period. Today many good obstetricians as well as good hospital departments of obstetrics have a prenatal service which supervises the health of the expectant mother, thereby preventing the development of nephritis and eclampsia. These efforts have assuredly diminished maternal mortality as well as definitely affected infant mortality.

The prenatal period is also an important time to care for the breasts. Much can be done to stimulate glandular development and to prevent difficulties with nipples if proper care is given them during this time. Such care during pregnancy will very often prevent infections of the breast, as mastitis, fissures or cracked nipples, all of which have a very definite effect on the early days or weeks of the infant's life. On the proper care of the breast may depend the successful nursing of the infant at the breast, as most mothers who are able to undertake nursing during the lying-in period should, in the majority of cases, be able to continue it for a period of months. No question is of more importance than that of breast-feeding, and for this reason the care of the breast during pregnancy cannot be overemphasized.

The medical supervision of the mother during the prenatal period should include a complete physical examination, noting the condition of the heart, kidneys and naturally a complete

pelvic examination. Periodic examinations throughout the period of pregnancy are absolutely necessary. If the mother has the slightest suspicion of syphilis, a Wassermann test should be taken of her and of the father as well. If either of these tests are positive, anti-syphilitic treatment should be given the mother. Beginning anti-syphilitic treatment early during pregnancy has undoubtedly saved hundreds if not thousands of babies during the past few years since this practice has been extensively followed by all good obstetricians. It often prevents the occurrence of premature birth, and in many instances a perfectly normal child may be born who will show no signs of syphilitic infection at any time. Such an infant must be kept under more intensive observation than a perfectly normal child. A mother with gonorrhea should be continuously treated. Even if she has been treated for this condition during pregnancy, it necessitates energetic preventive measures at the time of birth. This should include not only the ordinary installation of silver nitrate in the eyes of the infant, but, in the case of girl babies, of silver nitrate to the vagina.

The points to be especially emphasized for the hygiene of pregnancy are personal hygiene, proper nourishing diet, and sufficient rest.

The care of the patient at the time of delivery is, of course, an important obstetrical problem. The chief complication, which is preventable in most instances and which has a very definite effect on the child, is sepsis. This may be the factor which prevents the mother from nursing her baby. This is equally true of lacerations. Many mothers who are excessively lacerated are so uncomfortable or in pain during the postpartum period that they are unable to successfully undertake nursing their infants, and they may even become chronic invalids as a result.

Postpartum hemorrhages, usually unpreventable, not only jeopardize the life of the mother, but seriously affect her chances of nursing her baby. Successful nursing, however, may often be instituted by perseverance and care after recovery from this condition even though it extends throughout the greater part of the lying-in period. By the prevention of this complication the baby has a better chance to nurse and the mother will be in a better condition to care for her baby.

There are a few accidents of labor which even good obstetrics cannot avoid, but good obstetrics will meet most emergencies satisfactorily, and also give the baby a better chance during this time.

Of all infants born living, approximately 10 per cent die before

the age of one year; 25 per cent of these deaths occur in the first month from the following causes: Congenital weaknesses cause about 50 per cent of these deaths, accident of labor 10 per cent, upper respiratory infections 9 per cent, and atelectasis 8 per cent. Of all deaths at all ages, 20 per cent occur under one year, 5 per cent between one and two years, 4 per cent between two and five years, 3 to 4 per cent between five and fifteen years, a total of 32 to 33 per cent of all deaths which occur before the sixteenth year. The deaths under one year are chiefly from the following causes: Gastro-intestinal and nutritional conditions, mainly acute diarrhea and malnutrition, 40 to 45 per cent; acute respiratory infections, mainly broncho-pneumonia and pneumonia, 19 to 20 per cent; congenital malformation, 5 to 6 per cent; infectious diseases, especially pertussis and diphtheria, 5 to 6 per cent; tuberculosis and syphilis, 8 per cent. Many of these deaths have been markedly affected by modern methods of feeding and hygiene and preventive medicine. The only conditions which we have so far been unable to affect are the congenital malformations; all the others are susceptible of very definite influence.

The chief causes of death during the second year are, in the order of their importance: Gastro-intestinal diseases, acute respiratory diseases and infectious diseases, principally measles, diphtheria and pertussis (whooping cough). These can be very definitely diminished by modern methods of hygiene and preventive medicine.

The chief causes of death from two to five years are as follows: Infectious diseases, diphtheria, scarlet fever, measles and pertussis, and acute respiratory infections. Under proper conditions all these can be materially affected. The chief causes of death between five and fifteen years are practically the same as for the preceding period.

There has been considerable reduction in infant and child mortality in recent years. The chief factors in this reduction have been better prenatal care and proper food and hygiene during the first few years. The introduction of antitoxin has definitely reduced the deaths from diphtheria, and this should be even more so in the future, just as small-pox to-day is no longer the scourge it was in the middle ages.

But with all this great gain in cutting down infant and child mortality, maternal mortality has remained almost untouched by these efforts. To force upon the attention of the country the high fatality risks of pregnancy and child-birth has been most difficult of accomplishment as the long fight for the passage of

the Sheppard-Towner or Maternity and Infancy Bill shows. That bill is intended primarily to affect the maternal risk rate by the thorough education of the mothers in the need of care during the prenatal period and the importance of good obstetric service. The United States has been as wasteful of its mothers as of its forests. In 1918, the maternal death rate in birth registration for the United States was double that of England or Wales, 88.4 per 10,000 deaths. Out of 10,000 deliveries (live and still-births) the maternal death rate stood at 63.9 for all causes combined. Careful studies have shown that the maternal risk rate in childbearing is lowered by intelligently directed efforts over a long period of years. Birmingham, England, has probably about the lowest death rate reached in any city as a result of such efforts, 38. The question of the relative frequency of still-births as compared with live births is also of great importance. We know that low maternal death rates and low percentage of still-births do not of necessity go together. Philadelphia had a maternal death rate of 50 per cent greater than that of New York but Philadelphia has the same still-birth rate as New York. But it has been well established that the effects of many of the various causes of still-births may be greatly modified or even entirely controlled by proper care during pregnancy and labor. All efforts for child welfare begin with the mother and to lessen the risks of pregnancy and labor is to directly affect infant mortality.

There must be no gaps in the care of the mother. To bring the mother safely through pregnancy and labor and then to neglect her is as stupid as it is cruel. Postpartum care is almost as important from the child's standpoint as from the mother's. The mother must not get up too soon or attempt to do too much and the decision in these matters depends upon many factors; the whole environment, the family life, the demands of work, of other children, the ability of the mother to protect herself when she is up from fatigue and overwork. If a mother attempts the usual life too soon, it has a very definite effect on the amount of milk she is able to produce, and if her general condition is not good, her ability to care for her baby is immediately affected. The care of the breasts during the postpartum period is even more important than during the prenatal period. At this time the infection of the breast, mastitis, may occur if there has not been proper care and cleanliness. The breasts should be washed off before and after each nursing, either with plain water or boracic acid water. They should be kept dry in order to prevent cracking and chafing of the nipples.

Sore nipples will very often discourage a mother from nursing her baby and the pain caused by the infant nursing on sore nipples will diminish the secretion of milk for, as milk is a true secretion, any unpleasant condition will lessen its supply. Nursing a baby successfully begins with a state of mind, the mother's desire to give her baby the best chance possible. The breast-fed baby is the best equipped baby and far less susceptible to disease and infection than the bottle-fed baby. The nurse has every opportunity to help a young mother to realize this and to carry out the personal hygiene necessary to make nursing of the baby possible. If a mother really desires to nurse her baby, she is willing to make the necessary sacrifices and these are willingly and gladly made if she is convinced that it is best for the baby. The doctor and nurse are largely responsible for the mother's ability to nurse her baby. Good prenatal and obstetrical care are bringing better babies into the world as well as improving the general condition of mothers' health. This should not be lost by carelessness in postnatal care. It is natural that the mother after the successful birth of her baby should have a sense of freedom and relief. The months of quiet, restricted life and regular care of herself have culminated in the coming of the baby and the baby becomes the focus of all attention, often to the neglect of herself. I do not feel that it is over-emphasis to say that the nine months following the birth of the child is almost as important as the nine months previous and the general hygiene and care of the mother during that period is just as vital to the life of the baby. The satisfactory breast feeding that is the baby's greatest need can only be secured by the continuation of a regimen conducive to producing the best milk. A simple, regular life with a generous nourishing diet, regular rest and sleep, exercise and diversion adapted to her own capacity and tastes is essential. Every baby has a right to his mother's milk and the nursing care of a baby is dependent upon the care of the mother. Artificial feeding is never ideal, is never an entirely satisfactory substitute for normal breast milk. The most that can be claimed for artificial food is that it is, at times, a necessary expedient.

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CHAPTER III

THE NEWBORN: FIRST CARE

During birth, the nurse must be constantly alert to safeguard the child from the injuries of labor. As obstetrics advance in accomplishment of less difficult labor, shortening the period of labor, the danger of birth injuries to the child is less. The watching of the fetal heart during labor is fundamentally important and if this were done more universally we would have fewer still-births than we now have. Prolonged compression during slow and difficult labor is undoubtedly the cause of many cerebral hemorrhages, as is also improper instrumentation. Such accidents of birth will in time almost disappear as obstetrical service grows more and more skilled.

As soon as the infant is born, he should have immediate careful oversight. Every second counts if anything is wrong. To prevent atelectasis every effort should be made to make the lungs expand immediately, at the same time using utmost care not to hurt the frail infant. This is done most easily by making the baby cry lustily, by spanking him gently, holding up by the feet or holding him over one's hand, first, on his back with his legs, arms and head hanging backward—then over the other hand on his chest with his legs, arms and head hanging forward, thus causing inspiration and expiration of breath. Dipping a baby in cold water to make him cry and thus start normal breathing is of doubtful value as the sudden chilling of the little body is to be avoided. To place in a tub of water about 110° F. and alternately extend and double the little body, gives better results and if necessary, direct insufflation may be used then, protecting the baby's face with clean gauze and blowing directly into its mouth at normal inspiration intervals.

All these methods must be employed gently. The condition persists rarely in healthy newborn babies and in premature and weak infants great care must be exercised in dealing with atelectasis as any chilling of the body is in itself a fatal accident in such cases. Such cases try all one's skill and patience and the nurse sometimes has to face an hour or an hour and a half of persistent but gentle efforts to induce that first cry. The exposure risk is great as the body heat of the newborn infant

must be kept up, and if the first crying has been induced by any of the methods discussed, great care must be taken to restore as quickly as possible the body heat, and to avoid all exposure for a time (see Harmer, pp. 465–467).

The care of the eyes at the time of birth is of utmost urgence, particularly when there is any doubt as to whether the mother has a gonorrheal infection. The importance of eye protection has been emphasized in many states by laws requiring that 2 per cent silver nitrate be dropped in each eye. There should never be any deviation from this rule but care should be taken not to use too strong a solution and to wash the solution carefully out after the application with boracic acid solution or with plenty of sterile water.

Most cases of infection of the newborn can be traced to the cord as the route of entrance. The technique of dressing the cord must be that commonly used in the operating room, absolutely aseptic. A sterile dry dressing should be applied and not removed unless so ordered by a physician until the cord is ready to drop off. This usually occurs between the fourth and seventh day. If there are granulations after this period, they should be touched up with silver nitrate, and a sterile dressing or sterile stearate of zinc or bismuth powder applied. The usual condition requires no dressing after the seventh or eighth days (Fig. 1).

After the care of the cord and the eyes, it has been customary to give the baby an oil sponge off to remove the vernix caseosa and to conserve as much as possible of the body heat. My own hospital experience has led practically to the giving up of the oil sponge unless there is a rather stubborn adherence of the vernix caseosa in which case oil may be necessary to avoid skin irritation. Oil is difficult to keep sterile and if it gets rancid can be extremely irritating. In hospitals where impetigo and other skin infections of the newborn are frequent, it would be well to watch the oil. These skin infections are occasionally fatal, and until we have solved the infant mortality of the first two weeks of life, we cannot afford to run the slightest of risks. The use of oil has to my mind a very definite risk and I prefer the sponging off to be done with warm water of a temperature of 100° F. There should, of course, be no tub baths until the cord is off. Sponging or spraying the baby with the sterile dressing pad and abdominal binder protecting the cord, is the best. The cord is an open area at this time and must be cared for with strict surgical asepsis. Infections in the newborn have to be fought constantly, and the only solution seems to me to lie in giving every baby individual and aseptic care.

Many hospitals object to this on the ground of expense, but there is surely no real economy in the spread of infection in a hospital. Experience in my wards have proved that it pays and we have practically given up the use of tubs for our babies and have worked out individual aseptic care for each baby. Home nursing must have the same strict asepsis for the newborn and it is usually easier of achievement because the baby has his own individual outfit unused by anyone else. The bath, then, of the newborn baby, unless individual tubs are provided, should be a gentle sponging off with warm water and dried, not

Fig. 1.—Group of newborn babies. Showing abdominal bands sewed on. Baby without bands shows umbilicus healed.

by rubbing but by wrapping up in a soft towel that has been previously warmed. The mouth should be washed out with sterile water, using a soft cloth or sterile cotton wrapped around the little finger, always gently manipulated.

Before dressing the newborn baby he should be thoroughly examined for congenital abnormalities or deformities or for injuries which may have been received during delivery. A band eight to ten inches wide, made of flannel or of finely woven cotton cloth, should be stretched rather snugly around the abdomen over the sterile dressing pad of the cord and fastened securely by sewing it, permitting the lower end to be more snug

than the upper end, thus allowing for free breathing. The clothing should be warm but light and absolute cleanliness is essential. All clothes used in hospital care should be sterilized—in the home the careful boiling and laundering of the baby's clothing is usually sufficient. The newborn baby's clothing should be as simple as possible to prevent unnecessary handling. The binder we have described, then a shirt of wool and silk, a soft diaper and a slip of outing flannel that buttons in front is at first all that is necessary. Wrapping the baby after he is dressed in a warm square of flannel or two if necessary keeps him warm without tiring him by trying to put on extra flannel skirts. The clothing should be loose enough to allow the baby to exercise by kicking, though most of his exercise during the first few days is obtained by crying. There should always be sufficient diapers for the necessary changes and these, whether they are pads inside of loose cheese cloth diapers, or the bird's eye linen diapers, should be sterilized before use.

Besides the one or two short crying periods daily which are necessary for his proper lung expansion, it is most important to watch the respiration and circulation of the newborn baby. Hemorrhages may occur during the first few days. These may be due to many causes, the simplest of which is that the cord has not been properly tied. This can be easily corrected by the physician and his attention should be immediately called to it. After the first few days, hemorrhage may be due to sepsis or it may be a condition known as "hemorrhagic disease of the newborn." This condition is due to a lack of one of the coagulating factors, prothrombin, and the prognosis depends upon the extent of the hemorrhage. Hemorrhages due to sepsis are far more serious, and therefore the aseptic care of the cord which is the main source of entrance of infection of the newborn, is a fundamental part of the technique of the care of the newborn baby.

At the time of birth marked changes occur in the fetal circulation. The left heart takes on greater activity and enlarges. The fetal ducts begin to close and, most important of all, the pulmonary circulation begins to functionate more actively. The circulatory adjustments of the newborn should be closely observed, especially in connection with the expansion of the lungs and the regulation of heat and evaporation. The extremities should never be allowed to get cold. This is particularly true of delicate infants where the most careful attention to minute details might prevent many deaths during the first few weeks. It is important that newborn infants should not come in contact with infections, particularly respiratory infections. This is a

good rule to follow throughout infancy and childhood, and would save many a child, not only from many illnesses but from fatal endings.

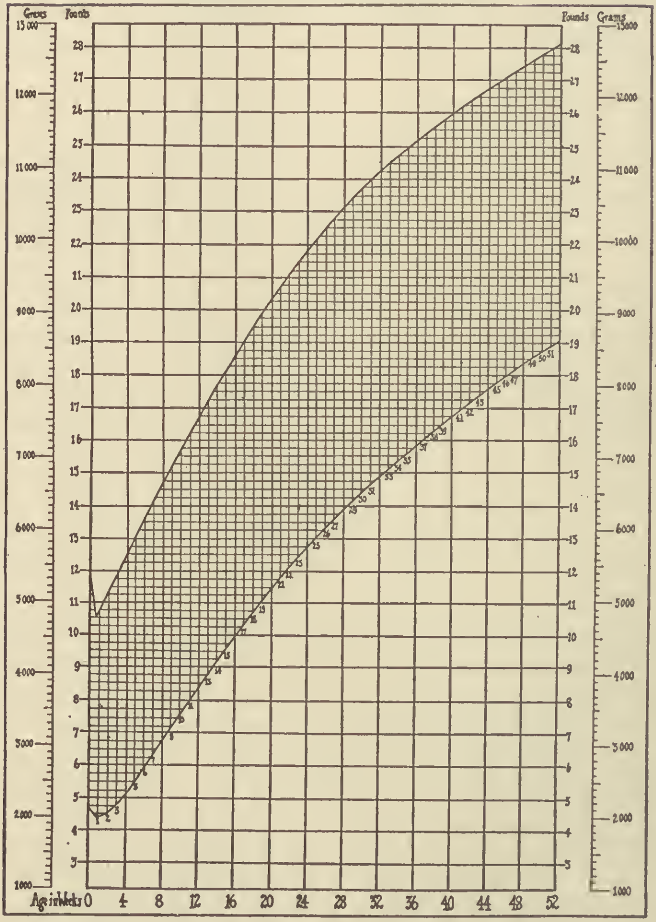
The average birth weight of infants is from 7 to 7½ pounds, or 3,200 to 3,400 grams. Weight is a very good criterion of the progress of the baby and is the one which is most commonly used, though there are many other factors which should be considered.

Immediately after birth a baby loses weight. This loss in weight is usually considered a physiological loss. It is due mainly to mechanical reasons, the loss of meconium and urine, and the fact that the baby takes very little food during the first few days. This loss in weight can be practically done away with if supplementary feedings are given from the beginning until the mother's milk comes in, usually by the third day. Supplementary feedings should never be given unless ordered by the physician. Water, on the contrary, should be given freely during the first few days. In healthy, vigorous infants, there is no cause for alarm at a loss of 200 to 300 grams (7 to 9 ounces). The heavier the baby, the more it is likely to lose during these first few days. An average baby, however, should not lose more than half a pound. The birth weight should be regained by the seventh day or at least by the end of the second week. If the baby has not regained his birth weight by this time, there is something the matter with the amount or quality of the food he is getting.

Dr. H. K. Faber has worked out the more satisfactory weight chart given here. This chart presents the weight zone for infants in the first year of life, which very successfully shows the standard maximum and standard minimum weight of normal full-time babies. The idea that the weight a baby reaches at the end of a year bears a perfectly definite relation to his weight at birth cannot be demonstrated by the single-curve weight chart. Some babies are large, rapidly growing babies and others are small, more slowly growing babies, and this chart seems to me to offer a very good way of registering these differences and more or less standardizing these normal divergences in weight gains.

The normal average length of a newborn baby is from 51 to 54 cm., an average of 52 cm., or from 20 to 21 inches. From the standpoint of health and development, the baby's length is of no great significance. This factor is more under the influence of heredity than is that of weight. A baby will continue to grow in length even if it does not increase in weight. Girls average slightly less in length than boys from birth. The normal infant

WEIGHT CHART—CHILD WELFARE DIVISION
DEPARTMENT OF PUBLIC HEALTH · SAN FRANCISCO, CALIFORNIA



Name..Born..............................

grows in length and in lateral dimensions with a rapidity proportionate to the increase in weight under normal conditions.

This discussion of growth brings us to the earliest established habit of the newborn baby, his sleep. His sleep should be almost continuous for the first months, waking only for his feedings, when he should not be allowed to fall asleep, and for the necessary care of his body. He is sometimes asleep during his sponge bath, if it is done quickly and skilfully, and the changing of diapers and the gentle moving of the newborn baby to new positions as he sleeps seldom disturbs the healthy baby. Nature aids us in securing this necessary sleep by delaying for a time the development of the nervous system. The newborn baby is not sensitive to noise, and whispering and walking on tiptoes is not necessary. His sleep is very deep and sound and he will sleep sometimes twenty-two hours out of the twenty-four, if properly handled. A quiet, darkened room is not necessary, as the sound sleep of tiny babies in hospital wards shows, but a well-aired room free from bright lights and sudden disturbing noises is the ideal sleeping-room for the baby. He should be kept dry and warm, but not hot. Perspiration leads to chilling and colds, just as does moisture from wet diapers. Changing the baby's position from time to time prevents the flattening of the soft bones of the head, and adds to his comfort in sleeping, just as the changing of the adult's position while sleeping brings periods of deeper slumber and new relaxation of body. Wakefulness and restlessness in the newborn baby are not normal symptoms and the causes for them must be discovered. The growth which must be taking place hourly is dependent largely upon long, sound sleep from the beginning.

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CHAPTER IV

EARLY OBSERVATIONS IN INFANT LIFE

I. CERTAIN CONDITIONS PECULIAR TO INFANCY AND CHILDHOOD

Early recognition of conditions peculiar to babies and young children, and sharp differentiation of these conditions from the same conditions in later life is essential.

1. **Conditions Existing at or Before Birth.** Some of these are readily recognized, hare-lip and cleft palate, striking malformations of head or body, malformations of brain, heart, kidneys, liver and other organs that manifest themselves in functioning. Some of these conditions are incompatible with life outside the uterus or the living infant may be gravely crippled. Many brain malformations are later the source of mental deficiency. It has been fully established that diseases are not inherited. Syphilis is practically the only disease transmitted in utero. Tendencies to later diseases of lungs, heart, kidney, etc., are undoubtedly inherited but these tendencies may be safeguarded. Perhaps "*nerves*" are the result of heredity, but environment does much to affect them as vital factors.

2. **Certain Conditions Immediately Connected with Birth.** Atelectasis is often the condition found in the first hours and days of life. The lungs, which before birth are flat and without air, must immediately expand. If this does not happen to some extent at birth, atelectasis results. If extensive areas of the lungs remain unfilled with air for any considerable length of time, the end is fatal. A child may live for some time with the minimum amount of air but continued failure of the lungs to expand is not compatible with life. Hemorrhage is sometimes a serious condition found in the newborn, due either to sepsis or some birth injury (Fig. 2) or to an actual hemorrhagic disease of the newborn, in which bleeding may occur from any or all parts of the body. Any such tendency to bleed may prove fatal. Some hemorrhages of the newborn are especially serious such as those occurring intercranially, where immediate surgical care is necessary if the infant is to have even a chance at life without serious brain damage, resulting in extensive paralysis or actual mental deficiency. Where strict surgical asepsis is the obstetrical prac-

tice, there is little infection of the newborn. The umbilicus, the open wound with which infants begin life, was the usual source of infection in those days of very high mortality of the newborn before Lister perfected aseptic surgical procedure. Naturally a newborn infant has little resistance to infection and any serious infection is usually fatal.

3. **Environmental Conditions Peculiar to Infants and Small Children.** The baby is helpless and dependent upon

Fig. 2.—Facial contusions caused by difficult and prolonged labor.

others for every detail of his care. He is also in these early days and months of life making rapid and enormous strides in growth and development and is in a so-called "fluid" state so that he is immediately affected by bad food and hygiene. He has more difficulty in withstanding the effects of such influences, and is more easily made ill by any of them.

4. **Contagious Diseases.** We consider most contagious diseases as peculiar to infancy and childhood because of the common occurrence of them at this period. The young infant is, on account of his youth, more susceptible to disease than an adult, and having had most contagious diseases early most adults es-

cape owing to the immunity thus acquired, or are not susceptible as adults. This latter statement holds true in ordinary civil life, but does not apply to adults brought together in great numbers as during the late war, when the contagious diseases were apparently as active among adults who had not had them, as they were during certain periors of childhood.

II. PATHOLOGICAL OR ABNORMAL CONDITIONS FOUND IN THE NEWBORN

Malformations are of two types, external and internal. The external malformations can be very easily recognized. They usually represent gross defects or abnormal development of some of the extremities. The importance in these conditions is whether they offer any hope of relief through surgical or other forms of treatment. Internal malformations are generally found in relation to the heart, the intestinal tract, and defects of the central nervous system.

External Malformations. There are certain malformations which exhibit strong hereditary tendencies, such as supernumerary fingers or toes and web formation of fingers or toes. Many of these can be corrected by plastic operations, though often these present difficulties and may result in permanent handicaps. Club-foot (Fig. 3) (talipes varus) is not a rare condition in infants, and varies in degrees; many are very slight and can be easily corrected, others need prolonged orthopedic treatment. Talipes valgus, or flat-foot, is also frequently found. This condition usually corrects itself, though there are cases in which the condition is permanent. The crippling from valgus, however, is rarely as marked as that from varus. Often the condition can be corrected by simple manipulation and through holding the foot in an over-corrected position with plaster. Later operative procedures may have to be considered. The important point is that the nurse should detect these defects early and report them to the physician, as they are very often overlooked. Knock-knee and bowlegs, genu valgum and varus, are uncommon in the newborn. They are usually found later in infancy, the result of rickets. When they do occur in the newborn, they can often be corrected by manipulation and holding the whole extremity in an over-corrected position with plaster of Paris.

Internal Malformations are very much more serious than external malformations. Among these are the disturbances of the *Circulatory System.* Congenital cardiac conditions are due to one of three causes, or to a combination of any two of these:

First, abnormalities from *persistent fetal conditions,* such as patent foramen ovale; *second,* abnormalities due to defects in the septum, or to stenosis of an orifice, usually the pulmonary, or malformation of a great vessel; *third,* abnormalities due to fetal endocarditis, commonly of syphilitic origin.

Fig. 3.—Club feet.

Symptoms. The most common symptom is cyanosis. It is present in 80 per cent of the cases and is found to vary from a slight tinge to a very dark leaden color of the mucous membrane and skin. Cyanosis is usually associated with lesions of the pulmonary artery and is due to obstruction rather than to a mixture of the venous and arterial blood. Cyanosis, however, may be due to other causes, such as enlarged thymus, atelectasis, to hemorrhage or to sepsis. Clubbing of the fingers, such as is

commonly found in older children with congenital heart disease, is in itself never congenital, but develops as the child grows. It is due to swelling of the soft parts, with a resulting osteoarthropathy. This usually appears in children with congenital hearts if they live to be four or five years of age. Dyspnea is a very common and often a constant symptom. It is often started by coughing or a quick exertion, or fright. Death at times may occur during an attack. Bulging of the pericardial region is usually present. The growth and nutrition of the child is practically always affected. Often these children resemble the picture of infantilism (a condition in which the growth processes stop and the child remains with all the appearances of an infant).

The Prognosis of a congenital heart depends upon the nature of the lesion. A patent foramen ovale diminishes the expectancy of life the least. Also, small lesions of the septum, where they combine with other lesions which neutralize each other, may be perfectly compatible with life and a fairly normal existence.

Stenosis of the pulmonary artery is the most grave. In general, of infants with congenital cardiac disturbances, one-third die in the first two months, one-third before they reach five years; the last third represents mild cases which often reach adult life, and if they grow up may give no symptoms. Moreover, minor lesions may never be detected, even after a careful examination, and may be found only at post-mortem examination.

Treatment. There is no corrective treatment. The hygiene, the daily regimen, the proper diet and the prevention of respiratory infections are most important in prolonging life. These cases need the same care as the most delicate or premature infant. If they grow up, the question of regulating their exercise and excitement and the type of work they will take up are all important.

Malformations connected with the *respiratory tract* are rare. When they occur, they are usually fatal, being connected with some type of incomplete closure of the thoracic cavity which is incompatible with life.

Malformations of the *digestive tract* are not uncommon. The most common malformations of the mouth and oral cavity are hare-lip and cleft palate (Fig. 4). These are not infrequent and may be either separate or combined. These malformations often interfere very markedly with the nutrition of the infant. It is important that nutrition be kept up, and this often necessitates the infant being fed by gavage or with a medicine dropper. They are rarely able to nurse at the breast. The treatment of these cases is always surgical. It has been found that if molding

operations are done immediately after birth that the end results are much better than if such operations are even delayed three or four days. By molding operations is meant the manipulation which brings the edges of the cleft palate more closely together, so that when operative procedures are undertaken the cleft will not be so wide and the stitches more likely to hold. Plastic operations must be done in steps in the majority of cases. During the post-operative period these cases often become septic

FIG. 4.—Hare-lip and cleft palate.

and are always difficult to feed. Sudden death may occur following operation. During the post-operative period it is quite difficult to keep up the nutrition, and for this the nurse needs a full measure of persistence and patience.

Congenital Pyloric Obstruction. This condition is not uncommon in early infancy. It makes its appearance during the first few weeks of life, usually from the third week to the second month. Pyloric stenosis occurs more often in male than in female babies, about 80 per cent of the cases being in males, and it also occurs more often in the first-born male child, and rarely occurs more than once in the same family. Because of

its early occurrence, it generally appears in breast-fed infants rather than in bottle-fed. Its etiology, or cause, is not connected with any kind of food. There are two main theories as to its production. First, that the thickening of the pyloric sphincter occurs first, followed by spasm; second, that the spasm is the beginning, caused by some intestinal or gastric irritation, and the thickening or hypertrophy is secondary. Cases having this latter origin usually make their appearance later than those in which the thickening is present at birth. The results are the same in both instances, partial or complete obstruction of food in passing through from the stomach into the intestine, producing projectile vomiting (see discussion, Chapter IX).

Abnormalities of the Anus. Congenital malformation of the lower portion of the rectum, either an absence of that portion or atresia, is sometimes found. The anal opening may be closed. These cases must be treated surgically. If there is a marked defect, they usually die. If operated on, the danger of sepsis is very great, as the field cannot be kept clean.

Abnormalities of the Urinary Apparatus. Occasionally abnormalities of the urinary apparatus are found. Congenital cystic kidneys or horseshoe kidneys may be present. Dystrophy of the bladder is a rare abnormality and is usually incompatible with life, and in most cases it is associated with other abnormalities. Malformations of the ureter are not uncommon, as a double ureter, or a dilated one. Hypospadias and epispadias may be present. These are usually not incompatible with life, and need operative treatment later. At the present time the surgical opinion is that these cases can be operated on better after the fourth or fifth year rather than during infancy.

Abnormalities of the Nervous System. Abnormalities in the development of the brain infrequently seen are anencephalus, hemicephalus and acrania. These conditions of partial or complete absence of the brain are rare. They are usually incompatible with life. Maldevelopment of the brain resulting in idiocy (Fig 5) is more often a hereditary condition, rather than a true malformation. A more frequent abnormality of the central nervous system is hydrocephalus. This condition is usually not present at the time of birth, but develops within the first few weeks or months. The first signs to be noticed are an increase in the size of the head and a separation of the sutures, the forehead appears to bulge forward and the eyes and face to shrink and shrivel. At times the eyes, due to pressure behind them, have an exophthalmic appearance. Hydrocephalus may be due to one of three causes:

Fig. 5.—Microcephalic infant showing narrow pointed dome of head, with strabismus and large nose and face.

Obstruction which is usually in the form of a tumor or lack of development of the floor of the fourth ventricle. In such cases there is an obstruction to the flow of the spinal fluid from the ventricles to the spinal canal. This can be accurately tested out by the introduction of certain dye substances into the spinal canal or into the ventricles and testing for its appearance in the spinal fluid from the spinal canal, or by the introduction of air into the ventricles and following its circulation by X-ray pictures.

The other two causes have to do with the lack of absorption and hypersecretion of the spinal fluid. These two types are

FIG. 6.—Spina bifida with paralysis, atrophy and deformity of lower extremities and beginning hydrocephalus.

more difficult to differentiate and are correspondingly more difficult to affect. At times the enlargement of the head may stop spontaneously, but in the majority of cases, unless operative procedure can be successfully carried out, these children fortunately die at an early age.

Another form of abnormality of the central nervous system has to do with cerebral or spinal hernia. The most common form is that known as spina bifida or hydroencephalocele (Fig. 6). There is a hernial sac, usually in the lumbar or sacral region, due to partial absence of one or more vertebrae resulting in a protusion of the spinal meninges filled with spinal

fluid. Usually there are some spinal nerves involved, with resulting paralysis of one or both of the lower extremities. This condition, if not too extensive, may be operated on successfully, though, unfortunately, an operation which may be successful from the standpoint of the spinal hernia may prove the beginning of a hydrocephalus. Other hernia may be present at the base of the brain, known as meningocele or encephalocele. These conditions are more rare than the condition of spina bifida and are correspondingly more serious.

Fig. 7.—Caput succedaneum.

Traumatic Conditions in the Newborn. A common deformity at the time of birth, known as the caput succedaneum (Fig. 7), is nothing more than an area of edema over a part of the head which presents itself at the os. As there is no pressure at the os, it is possible for serum to collect, forming a local swelling. It usually disappears in the first few days. There is no treatment. Another form of tumor due to accident or trauma is cephalhematomata (Fig. 8). This is due to a hemorrhage deep down between the pereosteum and one or more of the flat bones of the skull. The hemorrhage is usually limited to one bone and appears more often over one of the parietal bones, either on one side or the other. It is usually

fairly firm but after a few days the center becomes soft with a definite hard rim surrounding the soft area, and at times may be mistaken for a depressed fracture of the skull. This is a fatal mistake for a cephalhematomata should not be interfered with, as it takes care of itself by absorption. It should be left entirely alone and not be manipulated. The danger of interference is that it will become infected, and as this region is closely connected with the brain by means of blood and lymph vessels, this may end in a septic meningitis.

Fig. 8.—Bilateral cephalhematoma.

Hematoma of the sterno-clydo-mastoid muscle occurs at times where there has been difficult or prolonged labor, or instrumentation. The hemorrhage is usually into the sheath of the muscle, at first the muscle is indurated and tender. The child holds its head toward the traumatized side. There is no treatment for the hematoma, but unfortunately these cases often develop a wry neck, or orticollis. This can at times be prevented by holding the head in the proper position provided the muscle fibres are not ruptured or the nerves injured.

Internal Hemorrhage. Intercranial hemorrhages are due to trauma, either from prolonged labor or from instrumentation. The hemorrhage may be in the cortex of the brain, either over the occipital region or over the cerebellum. The amount of hemorrhage varies from a small clot to a very extensive one. If it occurs before birth and is extensive, the child may be born asphyxiated. The symptoms of the intercranial hemorrhage are those of central pressure, cyanosis, irregular respiration, bulging of the fontanelle, slow pulse, twitching of the facial muscles or of the extremities, which is at first localized and then becomes general, or general convulsions which may start in one of the extremities and then spread, or there may be general spasticity. It is very important that the earliest symptoms be recognized, as the earlier operative interference is obtained, the more likelihood there is of saving the life or of preventing life-long incapacity and damage if the child lives.

It is especially important that localized twitching should be noted and the exact group of muscles first involved noted. The same is true of convulsions, note in what extremities they begin before they become general. Symptoms of intercranial pressure may not appear immediately. The earliest symptoms are often refusal to nurse, the child may be very restless, or there may be a very marked stupor. At times there is facial edema. This is an important symptom when it is present. Localized nervous symptoms, when present, are very important as they indicate in what portion of the cortex the hemorrhage is situated. For diagnostic purposes a lumbar puncture is indicated. A bloody fluid is usually positive proof of a cerebral hemorrhage provided the blood is not obtained at the point where the needle is introduced. This can usually be easily determined. A clear fluid, however, does not necessarily rule out an intercranial hemorrhage as only when the hemorrhage is below the tentorium will the spinal fluid be bloody.

The **prognosis** of a cerebral hemorrhage is always serious. A large hemorrhage usually produces death in a few days. The nonoperative cases which live, usually show symptoms later, such as cerebral paralysis, epilepsy or marked mental defects. The prevention of cerebral hemorrhage is very much more important than the cure. The cure depends on operative treatment, opening the cranium and washing out the blood. The mortality in these cases, even in the hands of skilled brain surgeons, is very high.

Obstetrical Paralysis. Paralysis in the newborn may be due to trauma of the nerves during labor or to an intercranial hemorrhage. There are ordinarily two types of obstetrical

FIG. 9.—Facial paralysis due to birth injury.

FIG. 10.—Paralysis of right arm due to birth injury.

paralysis, one type involves the muscles of the face (Fig. 9), the other type the muscles of the shoulder and upper arm (Fig. 10). Either of these types may be produced by instrumental labor or by very prolonged labor. Facial paralysis consists of an exudation within the sheath of the facial nerve. The upper arm type of paralysis is often spoken of as Erb's paralysis. The symptoms of facial or brachial paralysis are usually noted on the first or second day. In the facial type there is a lack of symmetry, which is noticed when the child

FIG. 11.—X-ray showing fracture of humerus in both arms due to birth injury.

cries. In brachial paralysis, the humerus is rotated inward and the forearm is pronated so that the palm looks outward. The movements of the wrist and hand are not affected nor is the triceps so that the forearms can be extended but cannot be flexed. Atrophy usually begins in a few weeks though this may not be very marked during the first year on account of the amount of subcutaneous fat present. A diagnosis of facial paralysis must be differentiated from facial paralysis due to central causes, such as intercranial hemorrhage. Usually there are other signs of intercranial pressure as corticle irritation, in central paralysis. The eye muscles are not affected so that the

eye can be closed. Brachial paralysis must be differentiated from fractures and dislocations.

The **prognosis** of facial paralysis is good. They usually recover in a few months and often the symptoms disappear within the first few weeks. The prognosis of Erb's paralysis depends upon the extent of the injury to the nerve plexis, sometimes partial or complete recovery is seen in the course of a few months. The pronation and the external rotation of the humerus usually remains. Recovery after the third year takes place comparatively slowly. The earlier the treatment is begun the better. Treatment should be begun by the end of the first month and should be regular and continuous, consisting of massage, electrical stimulation and later educational gymnastics. Operative treatment, where there has been rupture of the nerves, is indicated. Passive movements of the joints and massage and exercises will do a great deal.

Cranial Bone Injuries are due to a very severe labor and instrumentation and are usually fatal. Fractures of the bones of the face, body or extremities (Fig. 11) are due to very difficult labor or instrumentation. They are often fatal.

Trauma to the lungs and abdominal regions when they occur also result from prolonged labor or manipulations and usually end fatally.

Epiphysial separation may occur where there has been manipulations. There may be no symptoms except a slight swelling or a pseudo-paralysis. The true condition can be made out by X-ray and needs surgical treatment.

Non-Traumatic, Mechanical Disturbances

1. **Umbilical hernia.** Small hernia at the umbilicus are not uncommon. Large hernia at the umbilicus are rather rare. There is usually no danger of strangulation in the small ones. Strapping the hernia by drawing the recti muscles together and holding them in this position for months usually gives the best results.

The most efficient treatment consists of strapping with adhesive strips (Fig. 12). The child is laid on his back or on the mother's lap and the region of the umbilicus and abdomen dusted with bismuth powder or aristol. One-half of an adhesive strip, 1½ inches wide and 8 or 10 inches long, is applied firmly to the right side of the abdomen in a line with the umbilicus. Traction on the free end of the strip is made with the right hand. With the index finger of the left hand the hernia is reduced and held in reduction by maintaining gentle pressure

with the finger over the umbilicus. With the finger still in this position, a fold of abdominal wall of the left side of the abdomen is grasped between the thumb and index finger and the fold brought toward the median line. As this is done, the adhesive strip is drawn over the area of the umbilicus and brought over the left side of the abdominal wall. The center of the adhesive strip should be over the groove occupying the position between the two vertical folds of skin, in the center of which is the umbilicus. The adhesive strip should be left in place until it loosens spontaneously. If a daily bath is given this will occur in about a week or ten days. Oil should be used when removing the adhesive as this will loosen the muslin from the adhesive without irritating the skin. The adhesive adhering

FIG. 12.—Wide adhesive strap for umbilical hernia.

to the skin should be dusted with ordinary talcum powder, rubbed in gently and then washed off with soap and water, which will bring the adhesive away clean. The subsequent strip of adhesive can be applied at a different angle in order to avoid using the same skin area which might cause irritation. This treatment must be continued for several months. Operation is indicated in severe types if strapping has not been successful.

2. **Inguinal hernia** is not an uncommon condition in both boys and girls though it is more common in boys. In the smaller hernia a yarn truss applied correctly will often not only prevent the hernia from coming down, but if worn continuously, the hernial opening will close, or become so small that the hernia does not come down (Fig. 13).

Fig. 13.—Front view of yarn truss for hernia on right side.

Fig. 14.—Back view of yarn truss for hernia on right side before end of yarn is fastened.

In applying a soft woolen "yarn truss," reduce the hernia by gentle manipulation before applying the truss. Cut the skein and tie the ends with thread for convenience. The amount of yarn required will depend on the size of the child and the hernia. Make a slip knot and pass the skein around the back of the child, bringing the loop just over the hernial opening, pass the free ends of the skein through this loop tightly being sure that the loop fits over the hernial opening. Pass the free

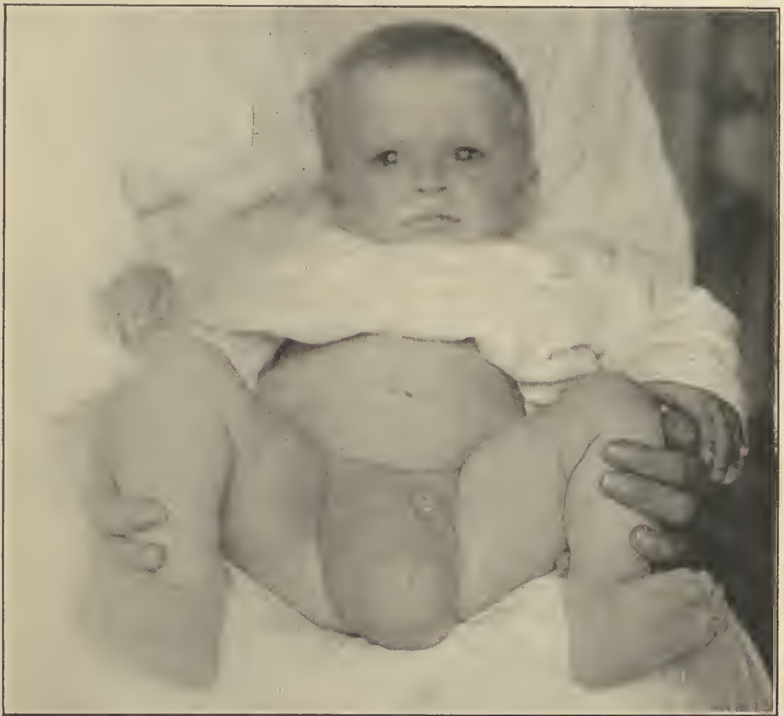

Fig. 15.—Hydrocele—showing distended scrotum with dilated veins.

ends around the inside of the thigh between the scrotum and groin. Bring it up tight around the back portion of the woolen skein and fasten in the back (Fig. 14). If care is taken this will be found sufficient to hold the hernia in position. In the severe cases where it is impossible to hold the hernia by a yarn truss, surgical procedure should be adopted. This can be safely undertaken during the first few months of life, though in the simpler cases it is advisable to wait until the child is 4 or 5 years old.

3. **Hydrocele of the cord.** (Fig. 15) Occasionally an elongated tumor extending into the scrotum is found. This is produced by an accumulation of serum in the tunica vaginalis of the cord. The tumor can be reduced though slowly. The same type of yarn truss used for inguinal hernia may be applied. Operations are seldom necessary unless the condition persists.

4. **Undescended testicles.** It is often difficult to determine whether the testicles are really undescended or not, as they have a tendency to slip up into the external canal. Unless they are in the internal canal, no operative procedure should be attempted during the first four years of life, as they will often come down of themselves. Where they do not come down, or where they are in the internal canal there is danger of atrophy. However, the danger of their becoming traumatized is greater than the danger of atrophy and causes a great deal of pain.

New Growths

1. **Umbilical Granuloma.** After the cord has fallen off, granulation tissue may remain due to improper care of the stump, often connected with a discharge which may be quite irritating to the skin. The granulomata should be treated with silver nitrate, and the skin kept dry and sterile dressings applied.

2. **Umbilical polyps or fungi** may result if the granulomata are not treated. These at times have to be excised and the base treated with silver nitrate.

3. **Nevus** (Fig. 16). Nevi are due to the formation of vascular tissue in the skin. The exact cause for this congenital condition is not known. It is supposed by some to be due to intrauterine pressure. It may vary from simply a red spot that appears on the forehead or face, or any other portion of the body, and which shows itself mainly when the child cries or is excited, or it may be slightly elevated (Fig. 17), dark red or purplish in color. It often feels like a collection of small earth or pin worms under the skin. In the majority of cases nevi do not extend nor grow. When they do grow, they should receive surgical treatment. They may be treated by freezing with carbon dioxide snow, by the electrical needle or by applying radium. Most nevi are so treated when they are disfiguring.

Functional Disturbances

Asphyxia neonatorum is a condition regularly found in stillborn children, in which condition the lungs have never expanded.

FIG. 16.—Linear nevus on neck. (Courtesy of Dr. Howard Morrow.)

FIG. 17.—Nevus on neck and raised nevus on forehead. (Courtesy of Dr. Howard Morrow.)

More often there is a partial lack of expansion of the lungs, the condition we know as atelectasis.

In **syphilitic babies** a condition somewhat resembling, but differing pathologically from atelectasis occurs and is known as white pneumonia. This is a condition in which there has been a definite fibrous change in the lungs. Most of these children die in the first few days or weeks of life.

Hemorrhagic Conditions of the Newborn. There are several types of hemorrhage which occur in the newborn infant. The hemorrhage may be due either to trauma, in such cases it usually happens fairly early, the trauma may be external or internal. The most common types of such hemorrhages we have already mentioned as intercranial hemorrhage and cephalhematomata. There may, however, be hemorrhage from the cord due to faulty tying, which will appear within the first few hours after birth.

Another type of hemorrhage is due to infection or sepsis. This is always connected with other signs of sepsis. The sepsis in most cases is connected with infection entering through the umbilicus and of course, is due to improper handling of the cord. This type of hemorrhage is usually associated with high temperature, marked prostration and dehydration and is often connected with marked jaundice.

Another type of hemorrhage found in the newborn is the so-called hemorrhagic disease of the newborn. The blood in this condition resembles very much the blood of true hemophilia, in which there is a definite disturbance in one of the coagulating factors of the blood, the prothrombin. For this reason transfusion of whole or citrated blood is usually successful. In mild cases the introduction of whole blood, intramuscularly, will provide a sufficient amount of the coagulating factors to stop the bleeding. Bleeding in any or all of these conditions usually occurs in the first week of life, whether it be due to trauma, sepsis or a deficiency in the coagulating power of the blood. The bleeding is more often from the umbilicus, but may be from the intestines, stomach, mouth, nose, genito-urinary tract, eyes or from the meninges. The amount of hemorrhage varies, sometimes there is only oozing, sometimes there is almost a steady stream.

Treatment depends upon the cause. As I have already stated, in traumatic cases, such as intercranial hemorrhage, some need immediate attention, and others, as in the case of cephalhematomata, need no treatment. Where there is sepsis the treatment is directed to removing the cause, treating the child symptomatically, and giving as much water and breast milk as

the child can manage. The outcome in septic cases is generally doubtful. In the so-called hemorrhage of the newborn as stated, the introduction of fresh blood has the best effects. The *prognosis,* however, in this condition depends upon how early this treatment is started. The effect of whole blood is often miraculous if it is applied early, as it should be. When the bleeding is very pronounced from the start even transfusion of considerable amounts of blood fails to save the infant.

Icterus Neonatorum. Jaundice is very frequently seen in the newborn, usually of a very slight grade. The ordinary jaundice represents a physiological process which is due to a clogging of the biliary ducts and is mechanical in origin, requires no treatment, appears the third or fourth day and disappears within a week. The color is usually pale yellow and the stools are unchanged. The urine in most cases is normal and does not show bile pigment. There is no enlargement of liver and spleen, and there is no rise in temperature. The general condition of the child is not changed. Babies eat and sleep well and gain at normal rate. The diagnosis of this type of physiological jaundice is made by the lack of symptoms.

A second type of jaundice is septic. This is a rare type and is usually combined with cyanosis and blood in the urine (hematuria). The temperature in this case is usually increased and of an irregular type. The liver and spleen are enlarged and there are marked signs of indigestion, either vomiting or diarrhea, and lack of appetite. The urine is bile stained and the stools also have bile in them.

Congenital Occlusion of the Bile Ducts. In this rare condition, jaundice is usually present at birth or appears before the second or third day and increases rapidly. The stools are clay colored. The condition is due to an intrauterine inflammatory condition of the bile ducts and is probably due to toxic absorption from the mother.

Another type of jaundice is associated with syphilis as there are signs of syphilis present in the infant. This is very rare and usually fatal.

Catarrhal jaundice is unusual in infancy. It is due to the swelling of the mucous membrane of the duodenum and bile ducts. This will be discussed later.

The prognosis in physiological jaundice is good. In septic jaundice the prognosis depends on the type of infection, but it is always a serious condition. In obstructive jaundice the prognosis is always grave and jaundice connected with syphilis is very serious. Cases of congenital icterus are not usually serious.

Sclerema Neonatorum. This is a rare condition characterized by a progressive hardening of the subcutaneous tissue. It is seen in premature infants and usually appears in the first few days of life but may appear at any time during the first few months in weak infants with marked malnutrition or diarrhea. The skin has a waxy glistening appearance and is hard and cold. The limbs become hard and stiff. The child becomes weak and refuses to take food. All the other symptoms of inanition, rapid breathing, weak pulse, whimpering and crying, are present. Sclerema must be differentiated from edema. In the former condition the skin is harder and does not pit on pressure. The prognosis is bad, not invariably fatal but usually so. Artificial heat and very careful feeding must be relied on.

Edema is occasionally seen in the newborn and is usually a symptom of other conditions, especially infections or grave metabolic disturbances.

Infectious Diseases of the Newborn. Any infection may appear in the early days of the infant, such as pneumonia or any of the pyogenic coccal infections. Inflammation about the umbilicus (omphlatitis) and erysipelas are common external infections. The onset is shown by a sudden rise of temperature, the temperature curve is usually very irregular and associated with it there is generally jaundice and hemorrhage. Jaundice is usually an early and constant symptom. Purpura often appears in the form of a fine petechial rash. The nervous system is affected with marked stupor or coma. There may be signs of meningeal irritation, twitching, spasms or convulsions. The liver is usually enlarged, and there is often abnormal distention. The umbilicus externally may not show any signs of infection. On the other hand, there may be definite redness and signs of inflammation around the umbilicus. The symptoms are often so obscure that it is difficult to make a positive diagnosis, as jaundice may appear as a physiological factor and the temperature may be due to inanition. Where the typical syndrome of fever, jaundice and hemorrhage are present with marked prostration and cerebral irritation, the cases usually die in a few days. Infectious diseases of the newborn are preventable conditions. They are comparable to puerperal fever. The majority of cases are caused by carelessness of some attending nurse, physician or parents. The essentials of prevention are cleanliness, absolute aseptic handling of the cord. The treatment is purely symptomatic, though sometimes transfusion is an aid.

Other infectious diseases which occur in the newborn are:

Syphilis (which is discussed later).

Tuberculosis does not usually appear in the newborn but such cases have been reported, apparently due to placental route infection.

Tetanus is very rare since the institution of aseptic methods in obstetrics.

Erysipelas is very contagious among the newborn. It is caused by lack of aseptic precautions and is usually fatal.

Skin infections are not infrequent and often the simplest may end fatally if not energetically treated from the first appearance

FIG. 18.—Impetigo of the newborn showing small vesicles.

of any lesions. Absolute isolation and asepsis are cardinal principles never to be forgotten in the care of the newborn. Even such mild skin disturbances as miliaria may, if not properly treated, become quite extensive and lead to a more serious form of skin infection, especially impetigo. Pemphigus and dermatitis exfoliativa are very serious when they occur and often prove fatal.

Impetigo neonatorum is one of the most troublesome diseases of the newborn (Fig. 18). It usually appears between the third

and seventh day of life and is characterized by the development on various parts of the infant's body surface of small papular, vesicular, pustular eruptions which spread very rapidly. These vesicles begin with a clear serum which soon becomes pustular in character. They have a tendency to coalesce and in breaking leave a red, denuded, weeping area. These areas finally heal without a scar. The danger from impetigo is not from the infection itself but from the fact that organisms can enter the circulation through this denuded area and cause general sepsis. When this occurs the condition really becomes a septicemia or a true blood infection. The organism usually found in impetigo is streptococcus, occasionally complicated with a staphylococcus. It is well to bear in mind this fact that the strain usually becomes stronger with succeeding generations and the first case in an epidemic is less likely to be as severe as the second or third or later ones.

Prevention is far easier than cure. Rigid aseptic precautions in the handling and care of the newborn are essential since transmission of the condition is through an attendant, physician, nurse, mother or visitors.

Prophylactic measures should consist of rigid inspection of the prospective mothers entering the maternity department, including bath and special attention to their hair and nails. The nurses and internes who are to be in the nursery should be carefully scrutinized; anyone with folliculitis or impetigo, acne, sinusitis or any type of streptococcus infection should be debarred from handling the infants or entering the nursery. In hospitals the danger from infection may be lessened by allowing more space between the basinettes. All clothing of the infant should be sterilized, and it cannot be too strongly emphasized that the nurse and physician should never fail to scrub their hands between patients.

Therapeutic Measures. When impetigo does occur the lesion should be opened early, the surrounding skin washed with a 1 to 2,000 bichlorid in 95 per cent alcohol and the lesion touched with copper sulphate stick or 25 per cent silver nitrate. I believe the copper sulphate is preferable (Fig. 19). After this the parts involved should be left open, as the air and sunshine have proved more beneficial than applying ointments and dressings (Fig. 20). As soon as a case is discovered it should be strictly isolated.

Other types of treatment suggested have been the application of 10 per cent silver nitrate after all the overhanging tissue has been removed. Several well-known dermatologists have suggested the application of 2 per cent ammoniated mercury, others

Fig. 19.—An enlarged picture showing impetigo lesions after treatment with copper sulphate.

the sponging of the remaining skin with 1 to 5,000 bichlorid of mercury; 1 per cent potassium permanganate is another remedy used beneficially, and Ormsby has used a dusting powder of calomel, boric acid and talc successfully.

The milder cases usually clear up quickly. The more severe cases are often fatal due to the secondary infections and septicemia. In these severe cases transfusions of the mother's whole blood has been found effective in bucking up the infant's resistance. This may be put into the longitudinal sinus or given subcutaneously. The dosage suggested for the latter is 30 c.c. of whole blood every six hours for at least three doses. The

FIG. 20.—(b) Infant held in position for open air treatment of impetigo.

fluid intake should also be kept up and where needed subcutaneous injections of quantities of saline solution may be given.

The responsibility of the nurse in the obstetrical department cannot be under-estimated. She sees the mother on entrance and knows her personal habits more intimately than the attending physician can. She must guard the helpless infant against contact with the proud father or visitors, even at the risk of being considered a martinet. Her technic in the nursery plays a big part in the discharge condition of the infant.

Pemphigus in the newborn is one of the more severe types of skin infections in which large bulla appear filled with clear serum. They have a tendency to coalesce, forming large areas, starting as vesicles (Fig. 21) 1 to 2 centimeters in diameter; they may become as large as the palm of the hand. The infecting

organism in this condition, as well as in impetigo, is supposed to be one of the types of streptococcus. At any rate, in these conditions the danger is from the denuded area formed and the

Fig. 21.—Pemphigus of the newborn. (Bullous lesions on leg.)

absorption of organisms into the blood stream causing a general sepsis from which most of these children die.

Fig. 22.—Dermatitis Exfoliativa.

Dermatitis, Exfoliativa (Figs. 22 and 23). Ritter, in 1879, gave the first description of this condition. The disease, for-

tunately, is very rare. It has a mortality of about 48 to 50 per cent. It usually appears between the second and fifth week of life. The symptoms vary considerably; the first is usually diffuse redness over the lower half of the face or mouth or it may begin in some other portion of the body. In the most virulent cases it is universal. The mucous membrane of the mouth and nose are sometimes infected. The epidermis becomes thickened and loosened so that there is very extensive desquamation. Usually the condition runs a course of a week or two weeks. The fatal cases generally become secondarily infected and die from this rather than from the original condition. The treatment is absolute cleanliness and constant care.

FIG. 23.—Dermatitis Exfoliativa. Note toxic condition of eyes.

Ophthalmia neonatorum is an inflammation of the conjunctiva in the newborn infant (Fig. 24). It appears as a slight irritation of the eyes, which rapidly increases and shows edema and profuse discharge of purulent secretion. This is to be differentiated from the slight conjunctivitis, not infrequently found following the use of silver nitrate. This conjunctivitis is very mild in character with little edema and comparatively little secretion. True ophthalmia neonatorum is always a gonococcal infection. The infection usually comes from the vaginal secretions of the mother. It may be carried to the eye by the hands of the physician or nurse.

The **symptoms** are characteristic, beginning with a slight redness of the conjunctiva, followed by rapid and intense inflammation of the lids. The upper lids may become so swollen as to

render the opening of the eyes impossible. On separation of the lids, greenish and sometimes bloody pus is seen. Ulceration of the cornea, perforation and loss of the aqueous humor may occur in the second day in virulent cases. Sometimes the swelling spreads over to the forehead and malar region. Recovery takes place slowly. Diagnosis is easily made. The discharge from a conjunctivitis, no matter how mild, should always be examined under a microscope.

Fig. 24.—Gonorrheal ophthalmia showing uninfected eye protected with sterile dressing. Infected eye shows marked edema and discharge.

The **prognosis** of true ophthalmia neonatorum depends somewhat on the virulence of the organism which is estimated by the time of the appearance of the conjunctivitis. Unless treated immediately, corneal ulcers usually result. The most important *treatment* here is prevention; Crede's method of prophylaxis—that is, 1 or 2 minims of a 2 per cent solution of nitrate of silver to be put into each eye of the newborn immediately after birth—is most effective. There are two indications in the treatment:

1. To reduce the inflammation.
2. To prevent the pus from accumulating behind the tightly closed lids.

Cold compresses should be applied to the eyes. These can be laid on a piece of ice and then put to the eye, and constantly changed. To remove the pus, gentle irrigation with a medicine dropper is best. Irrigating fluid may be normal salt solution or boracic acid or bichloride of mercury in the amount of 0.05 gram to 480 cc., or 1 grain to 1 pint of distilled water. In addition to these irrigations (Fig. 25), daily instillations of a 2 per cent silver nitrate solution should be used. Later argyrol or protargol 20 per cent should be used at least once daily. (See Harmer, pages 648 to 653.)

Fig. 25.—Irrigation of the eye.

Mastitis. Babies, male or female, often have a swelling of the breasts during the first week or two. This is not a true mastitis, and generally a milky fluid can be extracted. It is supposed to be a physiological process, and unless it is manipulated or rubbed will subside of itself and therefore should not be handled. A sterile dressing may be applied after washing the breasts off carefully with boracic acid or alcohol solution and drying carefully. Otherwise nothing should be done. If the breasts become infected, which they should not unless improperly handled, they must be treated surgically as any other abscess.

III. ANATOMICAL PECULIARITIES OF INFANCY

As the baby develops, care of him is made more intelligent and interesting if we have certain definite expectations, and these

must be based upon knowledge of what intensive studies of infant life have given us. The observing nurse makes her contribution to this ever increasing fund of information and those observations increase in value when based upon a knowledge of why things are as they are with the baby. The anatomical and physiological make-up of the baby is more or less standardized and it is logical to begin our study of the actual tangible body of the baby with a discussion of what the conditions are from head to foot.

The Head. At birth the head is large and oblong in shape (Fig. 26). This is due in large part to the passage of the head through the birth canal. The sutures between the bones of the

Fig. 26.—Molding of the head.

skull can be distinguished easily and are separated by soft tissue. In the occiputal region, the posterior fontanelle can be felt. This should be closed by the end of the sixth week, the anterior fontanelle or "soft spot" is not closed until the eighteenth month. If it is open after the twentieth month, it is abnormal. During the first year the occipital region of the head often becomes flattened due to the fact that the child lies too much upon the back, or there may be asymmetry of the head due to some habitual position in which the child sleeps. Some of these asymmetrical conditions are hereditary, but in most instances they will disappear by the third or fourth month. Other deformities of the head are

due to abnormal conditions, such as hydrocephalus or to nutritional conditions as rickets, or to congenital malformation of the brain itself. In such conditions there may be delayed closure of the sutures or of the fontanelles, or in certain brain malformations there may be too early closure of the sutures and fontanelles. This is usually associated with congenital mental defectiveness.

The development of the face during infancy is quite marked. At the time of birth the relation of the face of the infant to the cranium is about as one to eight, whereas the relation in the adult is about one to two. This is due to the fact that the lower jaw of the infant is undeveloped; there is really no angle of the jaw. The ramus of the lower maxillary bone develops during the first two years as the teeth appear. This development continues until all the permanent teeth are in. The baby has little fat pads in the cheeks. These are particularly well brought out during disturbances with the nutrition as these pads are the last to disappear. In nursing these pads serve a very definite purpose, as the gums of a nursing baby do not meet in sucking. They really serve the purpose of forming complete suction.

The neck of the infant is short. This is exaggerated by the fact that the head is very large and by the high position of the sternum, and is somewhat exaggerated by the large proportion of subcutaneous fat present in the normal healthy baby.

The Chest. The chest and head have practically the same circumference at birth. The chest is narrower at the upper part and does not widen out until about the fourth or fifth year. The ribs are more horizontal and far more flexible as they are mainly cartilaginous during early infancy.. For this reason deformities of the chest are very much more easily produced during infancy and early childhood.

In the upper part of the chest is the thymus gland, lying over and anterior to the base of the heart. This is larger at birth than at any other period. It gradually atrophies and by the time puberty is reached, it is very small. The thymus is supposed to be the cause of sudden death in certain infants due to a sudden swelling which puts pressure on the great vessels and nerves sufficient to cause strangulation. This condition is known as status lymphaticus and the exact cause of the condition is not known.

The heart during infancy is relatively large. It is less covered by the lungs and has a higher and more horizontal position. For this reason the cardiac impulse can often be observed outside the nipple line. This condition continues until about the sixth year,

at which time the heart rotates to its normal adult position. The pulse of the newborn is often irregular; at first it is about 120 to 140 beats per minute, but soon after birth it settles down to about 110 to 120 beats per minute, and at the end of the first year it should be about 90. The pulse rate of the baby changes very rapidly according to whether the baby is quiet or active, crying or fussy, under excitement or exercise, and during sickness with a temperature it may go up from 160 to 180. The rectal temperature of a normal infant falls between 98° F. (36.6° C.) and 99.5° F. (37.2° C.). The temperature of an infant is very easily affected, for the heat regulating apparatus in babies is very poorly developed. Temperature during infancy and early childhood should always be taken rectally.

The Lungs. At birth the lungs are empty, never having been called into use during the intrauterine period. As soon as the baby cries the lungs expand, the baby's circulation is changed from that of the foetus to the circulation of extrauterine life. Due to the rudimentary alveolar spaces, the thick walls and the abundant blood supply, the proportion of connective tissue in the lungs is greater than the air spaces. For this reason congestion of the lungs occurs more easily during infancy. This makes it very important to change the position of babies, especially weak and premature ones. Many chest deformities are due to the fact that infants have not been compelled to expand their lungs to their full capacity. Since the ribs are more cartilaginous and more flexible, they respond to positive as well as to negative pressure influences.

The respiration at birth is very often irregular, becoming more regular as the child grows older. During excitement or sickness, respiration throughout early childhood is more likely to be erratic. At birth the respiration varies between 45 and 70 per minute, though the normal rate for infancy is between 28 and 30. Like the pulse, the respiration varies a great deal according to whether the baby is quiet or restless.

The abdomen in the infant is prominent, the trunk is egg-shaped with a greater breadth at the lower region. The stomach in the infant is cylindrical and is almost vertically placed. The fundus of the stomach is only slightly developed during early infancy, and both orifices, the cardiac and the pyloric, open very easily. The anatomical capacity of the stomach at birth is about 42 c.c. or 1½ ounces. The physiological capacity is very much greater due to the elasticity of the stomach. Food escapes very rapidly from this cylindrical reservoir, which is practically all the stomach is during the early part of a child's life.

The liver is large at birth and palpable below the costal margin. In the newborn the liver is an abdominal organ, whereas later in life it becomes a thoracic organ, as the chest expands and the diaphragm is raised.

The kidneys are large and lobulated, the right one is usually lower than the left. At birth the pelvis of the kidneys is filled with uric acid crystals, which are washed out during the first few days and often occur as red glistening crystals on the diaper. These are often mistaken for blood. The kidneys are active from the beginning of life. An infant should be watched to see that it does wet its diaper and the frequency and character of the urine passed should be noted.

The bladder is more of an abdominal organ than a pelvic one, and extends as high as 2 cm. or 1 inch above the pelvis when full. The sphincter muscles of the bladder are involuntary. The control of these muscles can be very rapidly made to come under the habit-forming function of the mind. It is remarkable how early a child can be made to indicate when it needs to empty its bladder.

The intestines are less fixed during infancy than they are later. The small intestine measures approximately 9 feet 5 inches in length and the large intestines 1 foot 10 inches in length. Except for their small size there is no anatomical difference in the intestines during infancy and childhood.

The testicles in male children are descended. However, they slip up into the external canal very easily. Most boys when born have slight adhesions of the foreskin to the glands. These adhesions are easily broken up if there is no phimosis. If phimosis is present it is fairly easy to stretch with a small hemostat and by this correction circumcision may be obviated later. If the phimosis is very marked, or the foreskin is very long, a circumcision should be performed by the end of the first week. In cases where the foreskin is difficult to retract, the physician's attention should be called to the fact.

The spine of the infant is mostly of cartilaginous and fibrous tissues and should therefore be carefully protected during the whole of infancy. The child should not be allowed to sit up without support until late in the first year or the beginning of the second year, and even then it is best to protect the back when the child is sitting. Many curvatures and deformities of the spine could be obviated if more care were taken during the early months of life.

The teeth at birth are in their tooth sacs. The first tooth usually does not appear until about the sixth or seventh month.

Holt (Diseases of Infancy and Childhood, page 30) gives the following table for the development of the first teeth:

Development of Primary Teeth

(1) Two lower central incisors....	6 to 9 months.
(2) Four upper incisors..........	8 to 12 months.
(3) Two lower lateral incisors and four anterior molars........	12 to 15 months.
(4) Four canines.................	18 to 24 months.
(5) Four posterior molars........	24 to 30 months.
At one year a child should have...	6 teeth.
At 1½ years a child should have..	12 teeth.
At 2 years a child should have....	16 teeth.
At 2½ years a child should have..	20 teeth.

Many otherwise normal infants do not conform strictly to this schedule. Any very marked delay is usually due to some nutritional condition, such as rickets.

The eruption of teeth is a physiological process and is normal with most well babies, and not associated with any illness. There is, however, at times a certain amount of discomfort from swollen, tender gums, which may for a few days cause restlessness and a loss of appetite, but even this is usually very temporary. Only occasionally is there any illness due directly or indirectly to teething, and teething should only be blamed after every other possible cause has been ruled out. Nurses, particularly, should be careful not to attribute gastric or intestinal disturbances to teething. Delicate and rachitic infants, who teethe late, frequently cut a number of teeth at a time. Such a child, along with its irritability may have a slight fever and a lessened digestive capacity, and if its usual diet is continued an intestinal irritation with diarrhea may result. In such malnourished children, diarrhea may be the starting point for a grave nutritional disorder. However, many mothers and even physicians are too much inclined to attribute illness to teething, thus leaving the real condition undiagnosed and untreated. When the gums are much swollen and tender during active dentition, the baby may often be saved considerable discomfort by rubbing the teeth through or by lancing the gums. The eruption of teeth often varies in different families, some children having their teeth erupt early and some late. Occasionally a child is born with one or more teeth erupted, but this is to be considered an abnormality, and occurs more often in children with other abnormalities or in defective children.

IV. DEVELOPMENT OF THE SPECIAL SENSES AND FACULTIES OF AN INFANT

At this point in the discussion, I think it well to indicate briefly the stage of development reached by the special senses and faculties at birth and in the early months following. For our object, which is to increase our powers of observation, such knowledge is invaluable, as in the care of the baby his sensitiveness to many things is a most important regulator, we might say, of much nursing procedure. Absence of any of the normal sensitiveness bears a definite relation to all that is expected in the baby's growth and development.

Hearing at birth is impaired because there is no air in the middle ear, and also because of a swelling of the tympanum, resulting in partial deafness during the first few days. After the air sifts in and the swelling of the tympanum decreases the hearing is very acute. At three months the head should be turned toward a sound, and by three or four months voices are recognized. Very loud noises in early infancy may cause considerable fright and may affect the child's nervous system very definitely.

Sight. The infant can see, but the muscles act irregularly and inco-ordination is present. The cornea is only slightly sensitive and, therefore, should be guarded very carefully. As light is unpleasant at birth, the eyes should be protected during the first few months at least and should be watched throughout the whole of infancy. An infant will follow a light by the end of the first week but coordinate action for seeing is not established until about three months, and objects are definitely recognized by the fifth or sixth month.

Touch. The sense of touch is present at birth, but is poorly developed with the exception of the mouth, as in the tongue and lips it is very acute. The temperature sense is also very acutely developed while the localizing sense is very feeble. After the third month the sense of touch is well developed over the body. Sensibility to pain is present during early months but is not acute at this age.

The sense of **taste** is highly developed from the time of birth. Apparently the child at birth can distinguish between sweet, sour and bitter substances. This taste sense is often very different from that of an adult. An infant will often take castor oil, for example, which is most disagreeable to an older child and adult, and seem to enjoy it.

The sense of **smell** is developed very much later than the other senses. Fine differences in odor are not distinguished properly until late in childhood.

The absence of the development of the special senses at the normal time should be noted and the attention of the physician called to this fact.

There is a great deal of variation in the development of the faculties of infants but the average normal infant develops about as follows: He should smile at four or five weeks and should laugh before the fifth or sixth month, though babies often laugh much before this time. He begins to notice objects from the sixth to the eighth week and should be able to distinguish the mother and nurse from other persons at about the third month. A child should show signs of fear at six months, and should show likes and dislikes at about one year. Simple words are spoken by the tenth or twelfth month and short sentences are formed at about two years. Girls usually develop the power of speech earlier than boys. A baby should hold up his head at about two or three months, sit alone for a few minutes at seven months and begin to stand at about ten months. Marked delay in speech is most commonly due to mental defects and deafness. There is no reason nor excuse for the use of baby talk on the part of parents and attendants. The imitative powers in most young humans are very great, and to teach a baby for example a conglomerate language of his own, not understood by anyone but his immediate attendant, may make him seem cute and individual but it is not especially kind or clever. It often becomes a real barrier between him and the outside world and for a long time in his early childhood embarrasses him and makes him abnormally shy of strangers.

Any marked delay in muscular development is usually due to mental deficiency or to nutritional disorders, chiefly rickets.

The reflexes of an infant are often hard to elicit. The best position to elicit them is with the child lying down and relaxed. It is important while the reflexes are being taken that the child be made as comfortable as possible and his attention directed to some pleasant object. The nurse can often amuse the child while the physician is taking the knee jerk or other reflexes, important to elicit when there is any question of involvement of the nervous system. All these conditions must be recognized and reckoned with in the nursing care if the baby is to have his full chance at normal growth and development.

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CHAPTER V

HYGIENE OF INFANCY

In Chapter III we discussed the immediate care of the new-born baby and the first hygienic measures that must be taken quickly and skilfully to establish the very life itself of the normal baby. We emphasized but a few essential procedures, as the first effort is to conserve the baby's strength and get him to functionating properly as a human being. The hygiene of the whole period of infancy becomes more extensive as the baby grows and develops. New needs create new measures of handling the baby, and proper hygiene is of the greatest importance to the comfort and health of the baby. The regularity of a child's habits is one of the greatest contributions to his health, and these regular habits are begun at the very beginning by absolute regularity of the offices performed for the baby.

It is not paradoxical to declare that the most alive normal baby is the one who sleeps most of the time the first month, twenty-two hours out of the twenty-four of deep, sound sleep, as we have pointed out. This sleeping habit must be thoroughly established. The second and third months he should sleep from twenty to twenty-two hours; from the fourth to sixth months, from twenty to eighteen hours; at the seventh month, seventeen hours, and from fifteen to sixteen hours at one year. These sleeping habits are not whims or fads, but absolutely fundamental in the baby's normal growth and development. After the eighteenth month, in some children from the fifteenth, there should be an afternoon nap and from twelve to thirteen hours of sleep at night. This should be continued until the child is six years old at least.

In many instances it would be far better for the child if this were continued during the early school years. There should be from ten to twelve hours' sleep up to the age of eight or nine, and an average of ten hours should be maintained until the age of twelve years. A child should be trained to sleep at the same time every day, because regularity in bed time is important in forming good sleeping habits. The child should sleep alone, especially in a bed by himself. Sleeping with his mother constitutes two dangers to the infant: first, that the mother will

nurse him too frequently, especially if he is restless; second, accidents have been known to occur by the mother rolling over on the baby and suffocating him during deep slumber. This is not an uncommon cause of death and certain countries, such as England, forbid it by law.

During the time the baby is asleep the room should be protected from any glaring light and the temperature kept at an even range. If all details for his comfort have been carefully attended to and there is no cause for wakefulness, the baby should go to sleep promptly, and if there is firmness in this from the first, the crying in order to be picked up will cease. If the baby is put down for his sleep too warmly dressed or covered up, or with even a slightly wet diaper, or his arms or hands get into uncomfortable positions, he is going to fret until he is attended to, and he learns so quickly that crying brings handling. The first essential for his sleep, therefore, is a scrupulous regard for every detail of his care. Rocking a baby to sleep is the most unfair treatment for him, as it is an absolutely unnecessary procedure and forms for him a most pernicious habit that extends far into his little childhood, making his bed-time hour a dreaded occurrence for him and for his family. A baby so indulged will demand the presence of some one beside him until he goes to sleep. It is a habit so easy to form when a baby has perhaps not been well, but it is a habit so difficult to break that while a tender-hearted and ignorant mother can be excused for it in emergencies, a nurse can never be.

The nursery is a place of great importance in the baby's life, but should be a place of utmost simplicity. The room must be sanitary, which means a room in which absolute asepsis is possible and easy to attain. The baby's demands are of necessity many—the nursery should be simply furnished, with as many "washable aspects," we might say, as possible, in order that perfect cleanliness is possible, without sacrificing the valuable time and strength of a nurse. Good ventilation and quiet location, with a fairly even temperature, about 70° F. during the day and not much below 50° F. to 55° F. during the night, are necessary for a good nursery. The baby's small crib should have a firm mattress of hair or felt, and no pillow is necessary. The baby is better without a pillow, but if one is used it should not be more than a pad; either a very thin hair pillow or one or two thicknesses of felt. It is far more sanitary not to use a pillow, but to keep some light thicknesses of soft pads under the baby's head, which will receive the food he may spit up or the drooling when teething begins. These can be constantly changed and washed and boiled, ready for further use.

The baby's bath demands an orderly, systematic routine carried out with quickness and skill. Bathing the baby should never be a long-drawn-out process, nor should it be anything but thoroughly done. Slap-dash methods are never worth while, though at times of emergency they might seem justifiable.

A young English nursery maid during the war in one of the many crowded children's centers England established gave me a new phrase for "part time" bathing. It was five o'clock and the babies and little children were being prepared for bed. The nurse had the baby on her lap washing his face. When asked if she gave them a full bath, answered quickly: "Oh, no, sir; we 'aven't time but to top 'em and tail 'em."

Quickness compatible with gentle, careful handling does not mean lack of thoroughness.

The bath. After the cord is off the infant should be given either a tub or spray bath daily. The room should be warm and the water should range from 98° to 100° F. As the baby grows older the temperature of the water can be reduced. At four months the temperature may be from 90° to 95° F., and by one year a temperature of 90° F. is satisfactory. The temperature of the room at bathing time should be kept between 75° and 80° F. Care should be taken that there is no draft. Everything should be ready for the bath before the infant is undressed, so that all unnecessary exposure is avoided. All articles of clothing to be put on after the bath must also be ready at hand. It is also well to have scales nearby for weighing the baby either just before or after the bath. The better plan is to dress the baby on a table with the nurse standing, rather than to try to dress the baby on the lap. More time and effort are saved by this method than by the old method of holding the baby in the lap; especially is this true when many babies are to be bathed. For the same reason the spray is being used in hospitals instead of the ordinary infants' tub. This can be made with an automatic heat regulator, or simply with a reservoir in which the hot and cold water are mixed by the nurse herself before the bath.

Method of Procedure. First the face should be washed and then the head. The baby should be well lathered with Castile soap, the soap washed off under the spray or in the tub. The back must be supported and if the cord has not come off, the stump must be protected so that it will not get wet. If the cord is off and the baby is to have a tub bath, the baby must be securely held, the nurse slipping her left hand under his head in such a way that his head will rest on her wrist and her fingers and palm will support his shoulders firmly. With her right hand

she can steady him in the water and bathe him with that hand. After the soap has been entirely removed, in either sponge, spray or tub bath, the baby is rolled in a soft bath towel or a linen towel or soft sterilized diaper. In many hospitals a blanket is used to wrap the baby, and this covers all the body except the face. During the process no part should be exposed except that which is being dried. A large canton flannel towel or soft diaper serves well for the purpose of drying and may be used as a

FIG. 27.—Steps in baby's morning bath: Drying the baby.

blanket. The drying process can be carried out much more quickly on a table than on the lap (Fig. 27).

The infant's bath should be given before feeding time, and preferably in the morning, the usual hour being somewhere between nine or ten o'clock. After the bath most infants will take their feeding well, and then will go to sleep for their morning nap. During very hot weather, an infant should have, in addition to his cleansing bath, several sponge baths during the day.

Special attention must be given to the genitalia. In girl babies

the labia are separated and all smegma removed with cotton which has been dipped in sterile vaseline or oil. In boys the foreskin should be retracted daily and the smegma or other secretion removed from around the glands. Smegma accumulates very rapidly and the condition sometimes is very irritating. In girls, smegma will also accumulate in the upper part of the vulva. Care should be exercised in cleaning this out, as the skin of the genitalia is very delicate and pain is very easily inflicted. Stearate of zinc powder or bismuth powder may be used with good results under the arms and under creases or folds on the groin and neck, thereby preventing considerable chafing and irritation.

As the child grows older, the morning bath may be changed to one just before retiring. It is also a good plan to finish off with cool or cold water. As the infant becomes old enough to stand while being bathed, a quick douche with water at about 70° F. will not only be a good stimulant, but will be thoroughly enjoyed by the healthy baby. This can be continued, making the water colder as the child becomes older and stronger. No child should ever have a cold douche who does not react well to it with a healthy glow. If the child is cyanotic or cold, douching is contraindicated.

With delicate and premature infants, or infants who are recovering from serious sicknesses, the rapidity with which bathing and drying are done and the care about exposure are very important. If such an infant gets cyanotic or blue after bathing, a quick sponge bath is preferable to a spray or douche. In premature infants, it is often necessary to omit bathing for a time, and, when bathing is started, to do it at two- or three-day intervals. The skin in such cases can be kept clean and soft by means of sterile oil, care being taken that the oil is not rancid. Cocoanut oil is less irritating than olive oil, probably because it has less tendency to become rancid, or it has fewer volatile fatty acids.

The care of the mouth, eyes, nose and ears of infants is important. The mouth of the healthy infant requires no mechanical cleaning. If plenty of sterile water is given the baby daily, this will be enough mouth cleaning. When any conditions arise which call for further cleaning, it should be carried out with the utmost gentleness. Absorbent cotton twisted into a small spindle can be used, and is probably better than the ordinary way of using the little finger wrapped with cotton or gauze. The use of gauze is apt to be a harmful process as the mucous membranes are very easily abraded and the mouth thus becomes susceptible to infection. After the teeth begin to erupt, more attention must be

given to the gums. At first the cotton spindle is sufficient to clean the teeth and keep the gums in a healthy condition. Later a small, soft toothbrush can be used, often as early as eighteen months, using some simple powder or paste after the second year. Regular dental examinations should be made every six months. It is important that the temporary teeth be cared for just as regularly as the permanent ones. Caries of the temporary set should be filled with soft filling and though these very often drop out,

FIG. 28.—Steps in baby's morning bath: Cleaning the nose.

they should be replaced. Many mothers do not realize the importance of the first teeth to general health, resistance to infection, and that care of the first set assures a good second or permanent set. The temporary set should not decay but should fall out or be pushed out by the second set. If such hygienic care is taken of the teeth, and if proper dietary methods are followed, the number of poor alignments of the second set of teeth will be lessened.

The inner corner of the eyes may be cleansed with boracic acid

solution, washed out and dried with cotton. The anterior nares may be wiped out with a cotton spindle (Fig. 28). Any bland, sterile oil, as albolene, olive oil, etc., may be used. The outer canal of the ear can be cleansed in the same way.

Not infrequently during the early months there appears a seborrheic exudate on the scalp, commonly called "cradle cap." It is best to remove this by applying a good coating of vaseline at night, and washing off with Castile soap and warm water the next morning. It is inadvisable to use very much force in removing this crust by manipulation. If care is taken and

Fig. 29.—Steps in baby's morning bath: Brushing the hair after completely dressed.

the crust has been properly oiled, it will usually come off after at least two or three applications (Fig. 29).

Sometimes there are signs of irritation with excoriations on the buttocks, or even covering the entire diaper region. This condition is usually due to acidity of the stools or to the forming of ammonia from the urine. This can be generally avoided by changing the diapers immediately after soiling and by the proper washing and care of the diapers.

The diapers should be soaked immediately after they are soiled, washed with soap and boiling water, and rinsed out at least three or four times in plain water. It has been found in many of these irritative conditions that if the diapers are finally dipped

in a strong bichloride solution (1 to 2,000) and then dried, that the excoriations will improve very rapidly. In such cases it is the action of a certain type of bacteria which causes the breaking down of uria and the formation of ammonia. No strong soap or alkali should be used in washing the diapers. The baby's skin is very delicate, and if such chemicals are used, he is likely to suffer. The habit of drying a diaper which has been simply wet with urine and reapplying it is very bad, stupid and shortsighted! As already stated, the diaper is full of bacteria which have the power of decomposing the urine with the formation of ammonia, which results in excoriations. Excoriations are more easily prevented than cured. Whatever the causes of the excoriations or intertrigo, whether it is the diaper, the bacteria in the stools, or the ammonia in the urine, the more quickly the diaper is removed after soiling, the less likely is there to be skin irritation. Even a normal baby, if allowed to remain in its soiled diaper for any length of time, especially at night, will become excoriated. Ointment should be applied to such excoriations every time the diapers are changed. Ointment is preferable to powder, as it tends to protect the excoriated region. A good ointment is zinc oxide mixed with equal parts of castor oil. It is important that neither water nor soap should be used on excoriated buttocks; only sterile oil should be used in cleansing the buttocks.

All these possibilities for irritating troubles make it worth while to train even the little baby not to soil his diapers. Many babies can be trained to clean diapers as early as the the second and third month. It means a little extra care and patience but it saves, in the end, hours of energy for the nurse. This training can begin when a baby is a month old by closely observing the time of movements and at the same hour each day holding the baby in a comfortable position in the lap over a small basin placed firmly under the buttocks, letting the baby remain in an upright position well supported with its back against the nurse's body. At first the use of a soap stick moved gently in and out of the rectum will cause irritation enough for a complete bowel movement. In time nothing but the placing of the baby in the same position at the same time each day will be necessary for a satisfactory bowel movement, and only when he is resting on the small chamber. The establishment of such a habit not only saves time and effort but usually avoids constipation in later infancy, if the baby is properly fed.

This same procedure can be followed for urination, although during the early months it is more difficult. I have seen babies trained by the sixth month so they rarely wet a diaper, indicat-

ing their need by some special sound, such as a grunt. If this is done, the bed-wetting of later childhood is usually avoided.

As we know, the very young baby must cry as a valuable means of exercise two or three times a day. But even then he must not be allowed to form the habit of crying on all occasions of handling him. Later on, a well baby usually cries as a result of discomfort or from fright or anger, but it is remarkable how early this habit of just crying can be formed. Remember a baby is born with the ability to form habits, and this, to some degree, never leaves an individual this side of the grave. The common causes of discomfort are hunger, soiled diapers, irritated buttocks, difficult evacuation of the bowels, pain from any cause, such as unsuitable clothing or too tight clothing, pins or buttons in improper places and also excessive heat or cold. A sick baby cries not only from these causes but because it may have pain from such conditions as earache or colic. The habitual crier is more often a vigorous baby, who has learned to whine and is restless because he has had too much attention. On the other hand, a sickly baby cries from discomfort, very often of intestinal origin. These types of infants need treatment. The cry from temper and the cry from pain are entirely different, and the nurse who is accustomed to observing can usually tell the difference between the uncomfortable and the angry baby. One needs treatment and the other discipline.

Infant Clothing. The clothing of a baby should be light, warm and non-irritating. It should be suspended from the shoulder, and the clothing next to the skin should be of a type that can absorb perspiration. A garment with a little wool in it is more absorbent. All wool garments usually shrink and are frequently irritating, especially to the newborn infant. All cotton, during the newborn period, and until the child is several months old, is to be preferred to all wool. Silk and wool or silk and cotton, or cotton and wool, make the best undergarments. There are different weights of material for all seasons and changes. It is a mistake not to follow the changes in temperature of the seasons in clothing an infant. It is just as improper to over-dress as to under-dress babies. Heat, as well as cold, is damaging and makes it hard for him to thrive. In the hottest weather most of the clothing should be omitted and frequent sponging, as I have said, will make the infant much more comfortable (Fig. 30).

Clothing under one month. The very young baby, sleeping as he should all the time except for nursing, should not be dressed but once a day, only his diapers being changed as often as necessary. The abdominal band, which is kept on during this

first month, should be of yarn or cotton flannel. The shirt should be without bodice, usually the "second size" is better than the "first size" as these are too quickly outgrown. In many sections of the country a gertrude is worn. It is made of French or outing flannel and measures about 27 inches, from the shoulder to the hem, which brings it about 12 inches below the feet. The dress should be a plain slip with tapes rather than buttons or hooks or pins in the back. During this first month no stockings are necessary. though if the feet are cold, woolen or woolen-

FIG. 30.—Showing nurse dressing baby on a table in nursery.

cotton, or silk-cotton, short stockings can be used and pinned to the diaper. Usually the long clothes protect the legs and feet sufficiently. The diaper should be of light material and absorbent material, the best being bird's-eye linen or cotton. Linen does not permanently stain as easily as cotton, but is much more expensive and difficult to obtain. Canton flannel, if it is washed before using, is satisfactory. Stockinette is very satisfactory (Figs. 31, 32, 33, 34). If this latter material is used, a square compress of several thicknesses of cheese cloth

padded with a slight layer of cotton and placed within the diaper will take up all the stain and can be either washed out or thrown away. This type of diaper while travelling is particularly useful. Either cheese cloth for the outer layer or old linen can be used. It is better to use two diapers when the quantity of urine is large enough to soak one. If diapers are not to be washed out immediately after soiling, they should be placed in a covered receptacle partly filled with water containing either washing soda or carbolic acid solution in the proportion of one tablespoonful to a gallon of water. After this, the diaper should be rinsed out, boiled thoroughly, washed with a good grade of soap and rinsed several times in clear cold water. Diapers should not be dried in the nursery but should be dried out of doors or in a hot-air room. Such rooms are available in institutions but rarely in private homes.

The clothing from one month to the end of the first year changes very little, except the band is unnecessary after the first to third month. Usually a knit band hung from the shoulder, any time after the first month, can be used instead of the old-fashioned abdominal band. It is more satisfactory as it does not wrinkle and can be pinned to the diaper in front, which keeps it straight and smooth. The long dresses and gertrude are not advisable after the second or third month, though this depends somewhat on the climate. During the winter, when the weather is cold, it is perhaps best not to change from the long to the short clothes. It is more convenient to change the diapers when the baby has on short rather than long dresses.

Silk or cotton stockings with wool in them are to be preferred. In the summertime, plain cotton or no stockings at all are better than the woolen ones. No shoes should be worn until the baby begins to creep. Knitted boots or silk booties may do no harm, and when the baby is out will help to keep his feet warm. When he creeps he should have shoes with broad soles, and when he begins to stand the shoes should have stiff soles. Lace shoes give better ankle support than button shoes, though they should not at any time be tight. All shoes should have broad square toes with straight inner last. It is very important that babies be prevented from standing too early, or when allowed to stand that care be taken that they do not injure their feet. Many babies are allowed to stand incorrectly from the beginning when a little care would obviate many deformities or incorrect attitudes of the feet.

The night clothes should consist of two diapers, shirt and nightgown. In cold weather stockings may be added but during the hot weather it is better not to use them. Nightgowns

Fig. 31.—Putting on diaper: First step.

Fig. 32.—Putting on diaper: Second step.

FIG. 34.—Putting on diaper: Last step, pinning diaper to shirt.

FIG. 33.—Putting on diaper: Third step.

having a drawstring in the bottom are very good as they prevent the baby from being too much exposed. Also some nightgowns have drawstrings at the end of the sleeves which make it possible to pin the sleeves to the sides of the bed and thus prevent the baby from forming the thumb-sucking habit.

Exercise. Every baby needs some exercise for its well-being. Exercise during early infancy can be obtained by carrying the baby at regular periods about the room. A young infant should be held in the arms with the back supported rather than allowed to sit on the arms (Fig. 35). The back should be so supported that it neither bends forward nor too far back. A suspended position, that is, having the back on a straight stretch in holding the infant, is to be desired. Undoubtedly many curvatures and defects connected with posture would be obviated if more care were given to the back during the early months of infancy. Many orthopedic physicians believe that infants are allowed to sit up entirely too early and that they should be kept on their backs until they are able themselves to sit up. No effort should be made to make them take the sitting posture. When their back muscles are strong enough to hold the spine, they will usually try to sit up themselves.

When the baby is two weeks old, two regular short intervals of 10 to 15 minutes of carrying the baby about are sufficient exercise. This may be done either indoors or out-of-doors, depending on the weather. The amount of outdoor airing which a newborn infant should receive will depend entirely on the climate in which he is born and the season of the year. In the winter time, in the regions of the country where it is very cold, an infant may not be taken out until four to six weeks old. In most climates, however, if the infant is normal, there is no reason why he should not receive outdoor airing daily after the first few weeks. It is important to avoid strong winds, dust and the sun. The eyes and the face should always be shaded. Babies may begin their outdoor airing either actually out-of-doors or in a room with the windows open. Such infants are far more healthy than those always kept in warm, close rooms until "they are considered old enough to go out-of-doors." As the child grows older, by the second or third month, its out-of-doors trips may be taken in a perambulator or go-cart.

An additional form of exercise, which every healthy baby enjoys, is to lie stripped on his back and allowed the use of all his extremities. A normal baby will kick and squirm and so get a sufficient amount of exercise in ten or fifteen minutes during the day. If the crib is properly padded, and the baby not too tightly bound down with bed clothes, he will also get a considerable

FIG. 35.—Proper way to hold a baby, supporting back and head.

amount of exercise as he squirms and kicks in bed. No baby should be put directly on the floor. It is impossible to prevent a baby from getting his hand in his mouth, and the floor is always unclean, and cannot be protected from drafts. It is a well-recognized fact that most infants do better in their own homes than in institutions or hospitals for any length of time. This means that in most institutions the mothering is absent. The babies are not carried about, and are usually kept for weeks restricted in neatly tucked beds. As the infant gets older and stronger, he is able to take more exercise for himself, and he is more likely to thrive.

Pacifiers. Pacifiers are unnecessary and their use is a dirty habit. One of the most difficult habits to break is the use of a pacifier, or what is equally as pernicious, "sucking his thumbs." This latter often needs energetic treatment before it can be broken. The application of mittens, either wool or aluminum, or of stiff elbow cuffs, and sometimes several turns of adhesive around the thumb, may prove effectual. To break an infant of this habit when once formed, takes perseverance and determination. There is no question that many infants' mouths are deformed through the early use of pacifiers or thumb sucking. It is advisable to use nothing for the baby that is in common family use. The toys the baby plays with should be suspended so they will not fall to the floor, and they should be of such a character that they can be easily boiled.

The formation of habits for the baby and child means discipline not only of them but of grown-ups. The nurse is constantly endeavoring to form good habits for the baby. To do this she must be alert and awake to the fact that if the baby is not actually forming good habits, he is forming bad ones. He is not standing still. If babies can be taught regular habits of sleep, feeding, bowel movements and urination by constant and intelligent supervision, they are capable of forming many good habits and it is thus that discipline in the young baby is given. The early spoiled baby is merely the result of poor management, and means lack of discipline in the nurse herself. If the baby's schedule for feedings, bath, bowel movement, sleep, exercise and so on, is not absolutely regular and clock-like in its operation, the earliest means of disciplining a child are weakened and sometimes lost. The spoiled baby may often be a great handicap to himself during illness, and may, in fact, turn the tide against himself by using the energy needed to combat an infection, for unnecessary struggles against procedures used to save his life. Too many mothers, and unfortunately too many nurses, do not realize this point and so tend to spoil or give in to a baby simply

because he cries. This is the only form of expression a baby has, and an intelligent, healthy baby soon learns that he can get whatever he wants by crying. He may give up this particular habit as he grows older but the tracks of this type of habit formed in the brain will show themselves throughout life in some other type of tyranny. The slogan for the nurse in disciplining the little baby is "Live up to what you undertake to do." If it is bed-time, and the baby has been made perfectly comfortable and shows not the slightest symptoms of any pain or anything unusual the matter, and you are sure of his condition being the usual one, he must be permitted to cry in vain. Try everything but picking him up—let him alone for a reasonable time, as he usually gives it up and goes to sleep. If it continues, stand quietly by his crib and pat him gently, lengthening the intervals gradually until you leave off altogether and he is quiet. But if he is comfortable, it is better not to touch him at all but to perhaps do something else in the room, such as letting in a bit more air or lowering the shades. The baby will stop crying and listen to you and as he listens to the closing of the door again and the receding footsteps, he often drops off to sleep. It is the same with other things. Never let the baby's crying change your plans for him. If he is perfectly well and you are sure there is no cause for his tears but his temper, then quickly and gently carry out what you are doing for him. You are establishing his confidence in a system, and if you alter your system every time he cries, he soon learns that you don't mean what you *do*.

As the child grows older, the nurse or mother must continue to control him, and with his understanding you must get and keep his confidence in you. You continue to live up to what you do for him and you have got to live up to what you say to him. It is not necessary to tell untruths, in fact they are to be avoided. Positive statements, rather than "don'ts," are very much more effective with young children than the ordinary nurse or mother will believe. If you tell a child that this will hurt a little and take it as a matter of fact, the child will be much less disturbed than if you say "this will not hurt" and then proceed to hurt him, no matter how little. He will have lost confidence in you and will feel that he has a right not only to rebel against his physical hurt, but also to rebel against the untruth which he feels is unfair. Do not frighten or threaten an infant or growing child. If a threat is made, it should be carried out unrelentingly; therefore, do not make threats unless you are justified in doing so and intend to carry them out. The study of the psychology of the growing infant should be gone into by every nurse and

mother. Later I shall discuss at greater length some of the points which may be of assistance in training infants and children.

Vaccination. Vaccination of every baby against smallpox is part of the necessary hygiene of the period. The best time to do this is between the second and sixth month if the infant is gaining normally as the reaction from vaccination at this time is much less than later. Nurses should impress on mothers the importance of vaccination. They should know something of the historical fact that it is only through universal vaccination that smallpox does not occur as a serious epidemic disease of infancy and childhood. In the same way, after the sixth month, certainly by the end of the first year, infants may be tested for diphtheria by the Schick test. If the child is positive, which means that he has no immunity to diphtheria, he can be actively immunized by giving him toxin-antitoxin, which during this period has practically no systemic reaction. This immunity probably lasts two or three years when the child should be retested by the Schick test.

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CHAPTER VI

BREAST FEEDING

INTRODUCTION. INFANT NUTRITION

Fundamental in our study of the baby's nutrition is a knowledge of the normal processes of digestion and what the factors are that may enter into the disorganization of that digestive process. Nutrition and digestion are so closely related, so interdependent that the baby's progress in normal growth and development is just as much concerned with what he does with the food he eats as with the food itself. We may claim, quite rightly, that milk is the ideal food for the baby and we may see that even with the break down in the baby's ability to digest the milk, milk is still, in the usual case, the best foundation for any supplementary foods. But in handling the baby, nothing repays close study more quickly than that of the digestive possibilities; first, the normal process of digestion, then the various deviations of the normal, and how we may recognize these deviations and affect them successfully.

Digestive Processes. The salivary glands of the infant are active, but salivary digestion of food while milk is being taken is relatively unimportant as the saliva has no effect on the constituents of milk, and only acts on starch. The salivary ferment, ptyalin, is able, however, to begin the digestion of starches and carry it a slight degree by the time the baby is born. The process of digestion begins in the stomach. The casein of the milk is here precipitated by the rennin of the gastric juice in the form of curds. The curds from breast milk are small, soft and easily broken up, whereas the curds from raw cow's milk are large, tough and very difficult to break up. The curds from cow's milk, which has been boiled, resemble more nearly the curds from breast milk, although they are not so fine, nor so easily broken up. The proteins of the milk, the casein and whey proteins, are partly broken down by the gastric juice, but extensive digestion of protein does not occur in the infant's stomach. Starch digestion, if it is present, will continue slightly until the acidity of the stomach stops the salivary action of ptyalin, the salivary ferment, which can only act in an alkaline medium. No absorption of water takes place from the stomach. The time the food

remains in the stomach is variable and depends upon the composition of the food and the condition of the stomach muscles. Breast milk leaves the stomach sooner than does cow's milk. In the average infant fed on cow's milk formulae, the stomach is not completely emptied until about three hours after nursing, whereas with breast milk it is usually emptied at the end of two hours. A high percentage of fat in the food, whether it be fat from breast milk or cow's milk, leads to a slower emptying of the stomach.

The greater part of digestion takes place in the small intestine. Here the pancreatic ferments with the addition of erepsin breaks down the proteins from soluble peptones and albumoses to amino acids. It is the amino acids which are principally absorbed into the blood. The mixture of bile and pancreatic juice changes the fats into soaps and glycerine which are absorbed as such through the walls of the small intestine and are mostly taken up by the lacteals to the thoracic duct and from these distributed throughout the body. The pancreatic juices also contain a ferment capable of converting starch into sugar. The complex sugars are changed into simpler sugars by the secretion of the small intestine called "invertin." All carbohydrates are ultimately absorbed in the form of simple sugars, mainly glucose, levulose and galactose which are known as monosaccharides. Digestion and absorption of fat is practically completed in the small intestine. By the time the large intestine is reached, practically all of the protein and its products will have been digested and absorbed. Some remaining soaps from the fat digestion may pass into the large intestine. There is little or no digestion or absorption of the soaps in the large intestine. Sugars which reach the large intestine are quickly fermented by the larger number of bacteria present. These products of fermentation are chiefly acids and some of them are absorbed from the colon, the remainder are passed out in the stools. The large intestine is very active in the absorption of water, but under normal conditions is not called upon to absorb very much else.

There are comparatively few bacteria found under normal conditions in the small intestine, but enormous numbers are normally present in the large. These are of two main types, those which cause fermentation and those which cause putrefaction. The fermentative organisms depend for their existence on the carbohydrates in the food, while the putrefactive bacteria depend on the proteins for their food, so that the predominance of fermentative or putrefactive bacteria in the stools will largely depend on whether the balance in the food is in favor of carbohydrates or of proteins.

Stools. The first stools passed are called meconium stools. They are of a sticky consistency, rather dark in color without much odor and consist mainly of intestinal detritus, epithelial cells, bile salts and mucus. The color is mainly due to the bile salts which have accumulated during intrauterine life. Four to six of these stools are passed daily. About the third day the character of the stools begins to change as the true milk secretion commences, and by the fourth or fifth day they have assumed the characteristics that persist for the following months. An insufficient amount of food may lead to the passage of meconium stools for a longer period and meconium stools may reappear at any time when the child is on a practically starvation diet. The character of the stools depends, first, on the character of food which the baby is fed, second, its digestive power, third, the rate of absorption, and fourth, the intestinal flora.

Breast-fed stools. The breast-fed baby has normally from three to five stools a day, of a pea soup consistency and golden yellow in color. The color is due to the bilirubin from the bile. They have an aromatic odor, not at all unpleasant, due to lactic acid. They are acid in reaction because of both lactic acid and fatty acids.

Breast-Feeding. "The mother's milk is the ideal food for the baby" is a dogmatic statement, more or less, but it contains elasticity enough to allow us to make the necessary adaptations. Fortunately for the baby, the facts about mother's milk cannot be affected by the fads and whims of doctors. It cannot be mere chance or accident that milk is the one type of food which is complete in itself, that contains all the elements essential to and in the proper proportions for the nourishment of the young. Milk is a true secretion and responds to the stimulation of the infant's sucking. Milk of one species is specifically adapted to the growth of the offspring of that particular species, and although it is possible for the human infant to thrive on the milk of some animal, usually that of a cow, the difficulties in accomplishing this are not sufficiently appreciated. The breast-fed infant is usually healthier than the bottle-fed infant, though this does not necessarily hold true since the introduction of our modern methods of infant feeding, which are based on a scientific comprehension of the infant's digestive capacities.

Infant mortality statistics have up to the present time demonstrated that infants fed on breast milk have a distinctly better chance of living than artificially fed infants. The breast-fed infant is not only healthier and more robust, but he also has a better resistance to disease. According to statistics com-

piled by Davis only 25 per cent of infant deaths between the ages of two weeks and one year occur among breast-fed babies. The bottle-fed infant over two weeks of age is six times more likely to die than the breast-fed infant. Between 80 and 90 per cent of infant deaths between the second week and the first year from all causes occur in bottle-fed babies. Such statistics remove the whole subject of breast-feeding from the field of either sentiment or old-fashioned notions and places the maintenance of breast-feeding for the baby upon the level of urgency.

Many infants are weaned due to ignorance or carelessness on the part of the physician, the nurse or the mother. There is not sufficient appreciation or knowledge as to how to regulate breast-feeding to make it successful, and when breast-feeding is difficult, many mothers are not willing to continue to nurse unless urged to do so by the physician. Unfortunately many nurses assist the mother in her desire to put the baby on some artificial food. Fully 80 per cent of the mothers could nurse their infants for at least the first three months, which is the most difficult period from the standpoint of nutrition. If an infant suffers from nutritional disturbances while on breast milk, it is generally much more likely to suffer from digestive disturbances in a more severe form if weaned and put on artificial feeding. There are many misconceptions and superstitions regarding mother's milk as being poisonous for the baby. In fact, there are few mothers whose milk will not agree with their own baby, if they have a sufficient quantity and if the mother is in good general health. There is also a popular misconception that mixing breast milk and artificial feeding is unsafe. There is no reason why an infant cannot be partly breast-fed and partly supplemented to make up a sufficient quantity by giving other foods, and particularly properly prepared cow's milk dilutions.

There are certain valid reasons why a baby may not be able to nurse at the breast. This does not mean, however, that the same reasons apply for not giving breast milk to this same baby. In the first place the infant himself may not be able to nurse because of some deformity such as harelip or cleft palate. In such cases, it is mechanically impossible for the baby to suck. These are just the babies who need to have the advantage of breast milk. For the infant who is too weak or so premature that he is unable to nurse, every means should be taken to manually express mother's milk so that the baby will have the advantage of this form of feeding. Milk can be massaged or expressed from the breast either manually or by means of the

breast pump. In this way the baby's own mother may be able to supply a sufficient amount of milk for her delicate baby.

It may be impossible for the mother to nurse the baby because of poor glandular tissue, or due to the condition of the nipples. This may be corrected or improved. The breast may become infected and acute mastitis or abscess result, on account of which it may be necessary to temporarily or permanently remove the baby from the breast. If one breast only is involved, there is no reason why the baby cannot nurse at the other breast. There is no possibility of transferring infection to the baby from one breast to the other. The affected breast should have its milk manually expressed, and every intelligent procedure followed to bring the breast back to normal condition. In many instances, if this is done, the baby can return to the involved breast and successfully continue nursing.

The mother may be suffering from certain conditions which are themselves contraindications to nursing. The most valid reason for weaning is an active and open tuberculosis. A nursing baby is thus brought into such close contact with the infection that involvement is unavoidable. Such an infant should be weaned, but it is just as important to remove the baby entirely from the mother, as it is useless to wean the infant if the mother is still to continue caring for him. It cannot be too strongly emphasized that the mother with open tuberculosis should neither nurse, fondle nor care for her baby. If the mother has a closed or quiescent tuberculosis (osseous or glandular tuberculosis, for example) she may with safety nurse her baby, as the infection is not acquired through the milk.

A mother who is suffering from any serious chronic disease which reduces her vitality and keeps her in a poor physical condition, may be led to the necessity of weaning. This is mainly due to the fact that the production of milk is of very poor quality and often insufficient in amount. There are several active infections, such as puerperal sepsis, or any of the acute contagious or infectious diseases, where weaning is justifiable. Often throughout the course of such an illness the milk supply can be kept up by manual expression, though it is not usually safe to use the milk under such conditions. Many cases are on record in which the milk supply has been kept up for weeks and the baby has been able to go back on the breast. Temporarily, due to a severe hemorrhage or convulsions, it may be necessary to keep the baby off the breast for a few days. In such cases, if proper care is taken of the monther's breasts, the baby can safely be put back to the breast after the emergency has passed.

The mother who suffers from acute insanity or epilepsy should not nurse her baby unless she is under constant supervision, on account of the danger to the baby. Intentional or accidental harm to the baby have been reported too often to permit this type of mother to care for her baby without direct supervision.

The mother who has acute and severe nephritis, or who is suffering from acute and chronic conditions, always presents a problem as to whether nursing is too much of a drain or whether the quality of her milk is good. These cases must be determined individually after careful study by the physician. Usually, if either of the above conditions is acute, weaning is indicated. In the more chronic cases, mothers have been able to nurse their infants successfully.

Contrary to all popular conception, a mother, though suffering from syphilis, should nurse her own baby, for the milk is positively indicated as the best means of saving the baby's life. Such a baby cannot nurse the breast of a wet nurse, though assuredly he should be supplied with breast milk even if his own mother is unable to nurse him. A baby from a syphilitic mother should never be allowed to nurse at the breast of any but a syphilitic wet nurse or his own mother.

There are certain conditions in which it is rather problematical whether the mother should nurse her baby or not. Diabetes is a case one might cite. Usually nursing acts beneficially on the mother's condition by withdrawing a certain amount of sugar from her system.

During menstruation, which may occur during lactation, a baby may be slightly upset for a few days but it is not an indication for weaning. The baby may be fussy or irritable and have an increased number of green stools, but after a few days the baby will return to normal.

The occurrence of pregnancy during the period of lactation is not necessarily an indication for immediate or complete weaning. It is a question of the mother's general condition. If the drain on the mother is too great it is better to wean the baby gradually rather than to interfere with the growth and development of the foetus by the continuance of nursing. These instances are more rare than one would believe from the number of infants who are weaned for various causes. Mothers who are very nervous and subject to fits of temper, or are excitable, often affect their milk so that it disagrees either temporarily or permanently with the baby, but just what the changes of the milk are is not well understood.

When the quality or quantity of the mother's milk is at fault,

this may be changed by proper management of her diet, rest and exercise. When the mother's own nutrition is not normal, a generous diet with a liberal amount of milk and nutritious foods will often increase the quantity as well as the quality of her milk, but neither the quality nor the quantity will be affected when the mother is in good physical condition and properly nourished and living under normal hygienic conditions. There are certain general dietary rules which one may give but which are far from being invariably satisfactory.

If the milk is too rich in fats, the infant may be given a certain amount of water before nursing, and simply allowed to take the first portion of the breast milk, which contains less fat. This simple measure in itself may succeed, or the mother may be given less meat and milk and fat in her diet, and increase the quantity of water which she drinks. To increase the more meats, fats and milk. A diet high in fats and low in fat in the mother's milk, the diet can be changed by giving her carbohydrates may at times affect the output of fat in her milk. If the mother's milk is too high in protein, it may be affected by giving less meat and increasing the amount of exercise which she takes, to the point of fatigue. To increase the protein in her milk, give more meat and eggs and lessen the exercise, increasing the amount of rest which she takes, particularly just before nursing. It is rarely possible to affect the sugar content of breast milk, as this is the most constant factor and is but little influenced by diet.

A mother's milk may be of poor quantity or insufficient in amount and under such conditions not weaning but the addition of artificial feeding is indicated. The most important point in regard to the mother's diet is that she should receive a sufficient amount of nutritious food, but not to the point that it will interfere with her digestive capacity. There are no directions which are effective in increasing the milk supply. The most important factor in the increasing of the secretion of milk is the stimulation of the breast by the infant nursing regularly. Nothing can take the place of this stimulation. This is because milk is a true secretion and not a transudate. Therefore, the drugs which are ordinarily given in medicinal doses do not appear in the milk in sufficient quantities to affect the infant. If strong purgatives are given, they often upset the mother nervously, and so the child, but usually not enough to contraindicate their use when needed. Certain drugs have been found in small amounts in the milk, as iodine, salicylates, bromide, mercury, arsenic, antipyrin, urotropin, morphine and alcohol, when ingested in large amounts. Since milk is a true secretion,

if the mother is suffering from a deficiency disease, such as beri beri, the infant, if exclusively breast-fed, will also very likely have the same condition.

The Technique of Breast Nursing. The baby should be placed at the breast from four to six hours after birth, and every four to six hours thereafter during the next twenty-four hours, then regularly every four hours during the second twenty-four hours. Very little is obtained by the infant during this period, the object of this regular nursing being to stimulate the flow of milk. As the infant obtains very little milk, plenty of water should be given. If the baby does not take plain water, sugar solution, from 5 to 10 per cent, should be offered after the nursings, in quantities from 1 to 2 ounces every four hours. Most babies will show signs of being hungry after the first forty-eight hours. It is important to give fluids during this period as they will wash out the kidneys and make up for the water which the baby loses through its skin and respiration, urine and stools (Chart 1).

The true milk secretion begins usually about the third day, and unless a full amount of milk is obtained by this time, supplementary feeding is necessary. The first milk, colostrum, secreted during the first few days, differs very much from milk after true lactation is established.

After milk is established, the nursing may be continued at three- or four-hour intervals. The choice between the three- and four-hour intervals depends upon the amount of milk the infant receives from the mother in proportion to his needs. During the first few weeks many mothers will produce more milk on a three-hour than on a four-hour schedule and, therefore, the infant receives more and gains more rapidly. When an abundance of milk is produced by the mother a four-hour schedule is to be preferred, as the baby is less likely to suffer from vomiting, as there are longer periods of rest between feedings, and the mother also has longer periods for rest and recreation. When an infant shows signs of receiving too little food on a four-hour schedule, he should be fed every three hours. The intervals should not be any shorter than three hours. Such a schedule can be arranged that the baby will be fed seven times during the twenty-four hours at three-hour intervals during the day and twice during the night. This is usually sufficient to stimulate an increased supply of milk and to satisfy the baby. Another important factor in successful nursing is the regularity with which the infant is made to nurse during the fifteen or twenty minutes he is at the breast.

Most mothers after the second or third month are able to

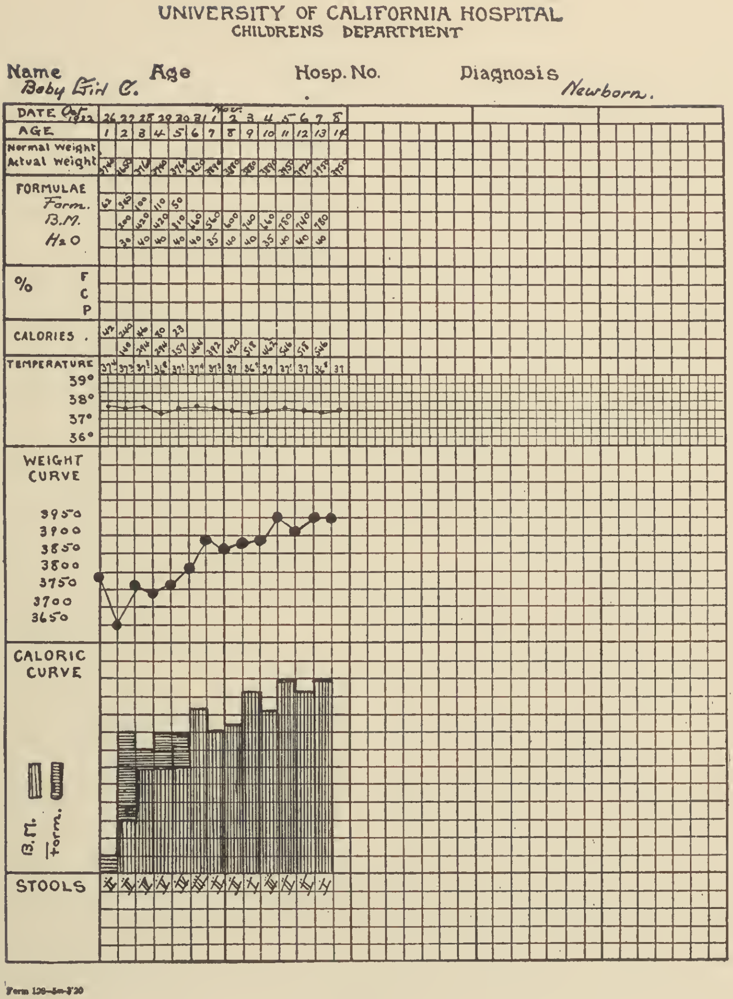

CHART 1.

Legend for

Baby Girl C.

(Newborn)

This chart shows a newborn chart in which the formula consisted of ⅖ whole milk and ⅗ water with 6 per cent added sugar. The weight chart shows a loss of 150 grams (5 oz.), but she regained her birth weight by the fourth day and on discharge the weight was 150 grams (5 oz.) above the birth weight.

successfully nurse their infants on a four-hour schedule, giving five nursings and leaving an eight-hour rest interval at night. This is the most satisfactory schedule to follow. Most American mothers after the sixth to eighth month do not supply sufficient milk for their growing infants, and their breast feedings must be supplemented by other foods. When we have decided on a schedule for an infant, such a schedule should be adhered to with the greatest regularity. If an infant is not awake at feeding time, it should be awakened to nurse. An infant will very quickly acquire regular habits and usually awaken at the proper time. A regular schedule allows a mother to plan her work and engagements and allows her a freedom which is impossible with an irregular schedule. Experience has shown that the crying, fussy, colicky, breast-fed baby is usually one with irregular feeding habits. The same condition may be caused by the mother leading an irregular life and losing a considerable amount of sleep. An infant should never be allowed to sleep with its mother and nurse throughout the night at frequent intervals.

It has been found to be a great advantage with breast-fed infants to substitute one bottle feeding for a breast feeding sometime during the twenty-four hours. Such a plan serves several useful purposes. It allows the mother greater freedom without which in certain cases mothers find nursing too great an obstacle to their social routine, and it also keeps the infant accustomed to a bottle, so that if weaning should sometime become necessary, or when normal time comes for weaning, he will accept without objection the new method of feeding.

In normal mothers the supply of milk is usually abundant and the infant may obtain sufficient milk from a single breast. For this reason, it is desirable to offer the breasts alternately, one breast for one feeding and the other breast for the next feeding. This plan usually succeeds in emptying the breasts more thoroughly than where both breasts are used at the same nursing and thus the production of milk is increased and the length of time the mother is able to nurse is prolonged. When both breasts have a large amount of milk and the baby is fed at both breasts at a single nursing, he may be very much over fed. This may result in discomfort, colic and even in acute intestinal disturbances. In most cases, however, when both breasts are given, it is because the infant does not receive enough from one breast. This usually occurs later in the nursing period and indicates that supplementary feedings should be instituted if they have not already been given.

When supplemental feeding is given merely for the convenience of the mother, usually a single bottle feeding is given in

place of a nursing. When it is given from necessity, the same plan may be used to a limited extent. It is to be remembered, however, that if an infant nurses less than a certain minimum at the breast, usually five nursings, that the supply of milk tends to decrease.

If it is necessary to give considerable amounts of supplemental feeding, it conserves the mother's supply of milk best to have the baby nurse regularly at the breast, and to give the necessary amounts immediately following each nursing. A good method of determining the amounts and proportions of the artificial feeding is to determine first what feeding would be proper were the infant entirely artificially fed. If a single feeding is to be substituted for a breast feeding, then an aliquot portion, that is, one-fifth or one-seventh of the total twenty-four-hour feeding, depending on the number of nursings, would be prescribed for this feeding (supplementary feeding). If the artificial feeding is to be given after each breast feeding, then it should be determined about what amount the infant receives from the breast at each nursing, and there should be prescribed sufficient of the formula determined upon to bring the total food up to the amount required. If, for example, the baby needs five ounces, and you find by weighing the baby before and after feeding that the baby has received but three ounces at the breast, the additional two ounces is given in the complementary feeding.

The average nursing time of an infant at the breast is from fifteen to twenty minutes. The time, however, will depend upon the strength of the infant, the amount of milk available, and whether the breasts are difficult or easy to empty. A great many infants will be satisfied and obtain sufficient for their growth in ten minutes or less. On the other hand, delicate babies may take a long time to obtain a sufficient supply, or when there is but little milk, the infant may give up the attempt to obtain it in a very few minutes. The only positive method of determining whether an infant has obtained a sufficient amount is to weigh him before and after each nursing. It is not necessary to strip him to get an accurate weighing before nursing. Weigh him before and immediately afterwards and the difference between these weights is the amount of breast milk secreted. The flow of milk is more rapid at the beginning of a nursing than it is later. It is estimated that about half the total quantity is taken by an infant during the first five minutes of nursing, more than a quarter the next five minutes and comparatively little after this time.

Absolute cleanliness is important with regard to both the mother's nipples and the infant's mouth. Both should be clean

and healthy at the time of nursing in order that neither may infect the other. As I have said, the nipples should be washed off with boracic acid before and after each nursing. The baby's mouth does not require washing and often more harm than good is done by trying to cleanse the baby's mouth. A small amount of water will usually be sufficient. It is a good plan to give this immediately after the nursing. The chief thing to be feared and avoided in connection with the mother's nipples is that they become sore, chapped or fissured. Any of these conditions make nursing a very painful process and at the same time they offer good opportunity to infection which may cause acute mastitis and even abscess formation. When an abscess forms it is usually necessary to wean the baby from the involved breast, at least temporarily, but the milk must be expressed from the breast, otherwise the breast will cake and become more subject to spread of infection and will be very painful.

It is important to keep the nipples clean, to dry them after the nursing and to keep them dry. It may be desirable to keep them soft with some such preparation as albolene, vaseline or boric ointment. If the nipples become tender, washing them with alcohol may give some relief. It is much safer to allow the baby to nurse through a nipple shield if the nipples become fissured, and if necessary keep the breasts empty by manual expression or a breast pump. In addition to these mechanical methods, strict cleanliness and the application of a simple ointment will usually be sufficient to produce healing. Fissures may be touched with 1 or 2 per cent solutions of silver nitrate.

The way in which the baby is handled during nursing and the position in which the head is held materially affect the ability of the child to take the breast successfully. (Fig. 36.) This is especially true with very large breasts where it is easy to suffocate or make it difficult for the baby to breathe. While nursing the breast should be held away from the baby's nose to allow for full respiration. After nursing it is well to hold the baby up over the shoulder and pat his back in order to get rid of any gas which has been swallowed during the nursing. Some babies have to be held up during nursing, especially those with a tendency to vomit easily and those who nurse too rapidly. As half the milk is taken during the first five minutes, it may be a good plan to hold the baby up after this time and again after the second five minutes and again at the end of nursing.

The baby should be carefully watched to see whether its weight, temperature, pulse, respiration, the condition of its skin and subcutaneous tissue and muscular activity are normal. The urine should be watched to see if the child is passing a sufficient

quantity, and the stools observed as to their character. One should not be too hasty in concluding that nursing is unsuccessful. The weight of the baby is the most reliable indication as to whether he is being successfully nursed. Between the fifth and sixth month a normal infant should double his birth weight, and triple his birth weight by the end of the first year. This makes an average gain of about 4 ounces a week. The gains from day to day are not at all uniform, but if taken weekly, there should be a consistent gain. An infant should be weighed twice a week at first, once a week after the second month up to one year. The main symptom of unsuccessful nursing is failure to gain.

Rarely, unsuccessful nursing is shown by the presence of intestinal indigestion. Whenever there is a question as to

FIG. 36.—Picture of wet nurse nursing her own baby.

whether the nursing is successful, the quantity and quality of the mother's milk should be tested. Quantitative analysis for fat and protein can be easily made. The main error, however, in most analyses, arises from the fact that not all the milk from the breast is obtained. If only the first milk is taken, it will be found low in fat; if the last only is taken for examination, it will be found high in fat. The only safe way is to take all the milk from one breast, and a mixed sample of this is sufficient for complete analysis. The real question is the effect of the nursing on the baby rather than the proportion of the different constituents of the milk. It is necessary to decide whether to continue nursing and to endeavor to correct either the quality or quantity of milk through treatment of the mother. This can sometimes be done by correcting her diet or regulating her exercise. It may

be considered advisable to partly nurse and to supplement by an appropriate formula up to the amount necessary for the baby to gain regularly and to continue robust. Or, on the other hand, it may seem advisable to stop nursing temporarily, pump the breasts and try to improve the breast milk. This latter method usually fails. Under ordinary conditions a two or three weeks' trial of carefully studying and watching both the mother and the baby should be undertaken before weaning unless there is some definite indication for rapid and immediate withdrawal of the baby from the breast. Whenever it is possible, weaning should be gradual over a period in which both feedings, supplementary and breast feeding, are used. Often it is satisfactory to give one supplementary bottle a day, increasing the bottle feeding every second or third day until the baby is completely weaned.

As has been stated, the normal stimulus to the flow oi milk is the infant nursing at the breast. When this is suddenly stopped, the milk continues to be secreted and the breasts become "caked" and are very painful, even if they are emptied by manual expression or pump. In most cases, if the plan outlined of gradually withdrawing the baby from the breast is followed, the milk will diminish and the breasts dry up.

No galactagogues (drugs increasing milk secretion) have been found successful in increasing the output or secretion of milk permanently. The corpus luteum and the posterior lobe of the pituitary body will increase the flow of milk during the first twenty-four hours they are administered. After this period the secretion will usually diminish rather than increase.

The normal breast-fed infant has the appearance of being well nourished, his flesh is hard and firm, his cheeks and nails are pink. He is happy and active when awake, and should be comfortable at all times.

Early Nutritional Disturbances. Breast-fed babies suffer from gastro-intestinal indigestion, discussed often under the names of colic and dyspepsia or weight disturbances. Overfeeding and underfeeding are the most frequent causes of this condition. *Overfeeding* can be easily indulged in. Some babies are allowed to nurse for too long a period, or they are nursed too often, every time they cry, and this establishes the irregular feeding habits most pernicious for the baby. These conditions of care and routine can be overcome, as we know, by regulation. But overfeeding resulting from too rich content of the breast milk itself, presents a more difficult problem. Fat causes the most trouble, and this demands a most careful analysis of the milk, though there are certain symptoms the baby himself pre-

sents, that point to fat as the source of the trouble. Colic is a usual symptom, and means primarily the active moving of the intestinal tract, causing pain and sharp crying.. But around the word colic has grown up a whole picture of the baby which may or may not include all or many of the following conditions:

If the irritation is primarily in the stomach or gastric, an early symptom is the vomiting or spitting up of thick fatty curds which smell sour. If the irritation is mainly intestinal in origin, there will be an increase in the number of stools, often grass green in color with considerable amounts of mucus and small seedlike fatty curds. These stools are at times passed with considerable gas, and cause irritation to the buttocks. Because of frequent stools, the urine is often concentrated with a strong odor of ammonia which increases the irritation of surrounding buttocks and thighs. The child is restless and fretful with crying and disturbed sleep or disturbed circulation giving cold extremities. As the condition progresses the child grows pale and its tissue flabby, which is often spoken of as reduced tissue turgor. These conditions lead to lowered resistance and more frequent infections such as naso-pharyngitis or cold in the head, and infection of the adenoids and the middle ear. The condition of eczema and seborrhea of the scalp are frequently found or associated with this type of indigestion. The weight curve in these babies varies considerably, marked gains and losses occur at different periods but the average curve wave is consistently below normal. These conditions are only permanently cleared up by the regulation of the diet as to intervals and quality; to meet the immediate symptoms of vomiting, nothing does it so well as washing out the stomach; the colicky condition is best handled by colon irrigation. Unfortunately the cart is often put before the horse in handling these conditions by treating the symptoms rather than the cause. Stomach washings and colon irrigations cannot cure the general condition. To relieve the colic by castor oil dosing is usually only inviting more trouble, as the intestinal irritation is increased. Another vicious practice to be considered in connection with overfeeding is all-night nursing, which is very likely to happen when mother and baby sleep together. This not only causes great loss of sleep for the mother, but also produces an uncomfortable intestinal tract in the infant. The manifestation of overfeeding with breast milk may be no more than excessive gain in weight, but more frequently there is evidence of some gastro-intestinal disturbance due in large part to bacterial action on the unabsorbed food. The common result of such a disturbance is colic. In more severe cases there is vomiting and diarrhea. Colic, however,

may also be due to swallowed air in an otherwise normal baby. In acute infections there is a diminished power of digestion and absorption, so that an infant suffering from any infection, even though receiving normal amounts of food, will have colic and often vomiting and diarrhea.

The problem of overfeeding in its simplest terms is the amount of food and water the infant is able to digest successfully, conditions usually reflected in the infant's weight. If the infant is receiving too large amounts of food, he must be fed at longer intervals and for shorter times. Often the giving of water just before a feeding will successfully cut down the intake of food.

Underfeeding. The usual obvious sign of underfeeding is the failure to gain in weight at the normal rate. Such infants often seem to "stand still" in weight before the actual loss is begun. However, the food problem is a question of quality as well as quantity. Certain symptoms are usually present, crying, restlessness, with poor sleep; the stools will vary according to the quality of the milk, they may maintain the normal yellow appearance or be the loose brown shading to dark green stool of starvation. They may be passed infrequently.

Determining Causes of Underfeeding. To differentiate between overfeeding and underfeeding can only be accomplished by great care and patience in weighing the evidence. Both colic from too much food and hunger from too little will cause sharp crying. The loss of weight and loose green stools may accompany many parenteral infections and the cause may lie there rather than with the milk.

Certain things must be definitely known and not guessed at, as the whole success of the nursing period depends upon thoroughness in studying the problems. If the normal quantity of milk is present and the baby is actually getting that normal quantity, one factor is eliminated. The mother's milk can be accurately measured, the baby can be held in the proper position for nursing which is a comfortable position in which the baby is able to suck most easily and breathe most freely. A baby cannot either suck or breathe properly when held uncomfortably or too tightly against the breast shutting the air away from the nose. Such mechanical causes as the poor, small or inverted nipples of some mothers are definite causes of underfeeding and must be overcome by the use of the nipple shield, if possible, although such nipples usually in time cause a diminishing of the supply of milk. The measuring of the supply of milk by taking the average of several nursings or the entire twenty-

four hour secretion by weighing the baby before and after each feeding will accurately determine the quantity. The quality of the milk should be determined by chemical analysis, especially of the fat and protein, as the sugar seldom varies.

Vomiting when present with the signs of underfeeding may be caused by the condition of pyloric stenosis which we have discussed in Chapter IX where a typical type of vomiting occurs. The underfed baby as a rule does not vomit unless there is a real lack in the mother's milk or the mother or the child are nervous and high-strung and the living conditions are not conducive to a proper nursing "atmosphere." Both mother and child should be allowed to devote themselves to the business at hand and not be disturbed and distracted during the nursing period. Often the extreme case of an underfed baby will have vomiting as a symptom of weakness and its resulting irritability.

Constipation may be caused in underfeeding of the breast fed baby by too little fat or sugar content. Most normal breast fed babies are free from this condition. It may be easily regulated by giving a small supplementary feeding having a relatively high percentage of sugar such as a malt soup extract. The addition of diluted fruit juices and plenty of water is of great help and these measures are always to be used instead of drugs, suppositories or enemas. The treatment of these various causes of underfeeding is fairly obvious once the cause is determined. Occasionally one finds a normal breast fed baby that only has a stool every other day but shows no sign of disturbance. No change is necessary in the régime of such an infant as long as the infant does well. Such a condition usually corrects itself when the child is put on mixed feedings.

Inanition Fever is not a simple underfeeding problem but is the acute manifestation of a sudden and rather marked withdrawal of fluid. It usually occurs in the first few days of life because this is the period when the maternal secretions are small in quantity and the infant is losing considerable amount of water by evaporation and by stools and urine. The temperature center of the newborn infant is more easily affected and may rise quite high although 102° or 103° F. is the usual level. A similar type of temperature and from the same cause, occurs as we shall see from the sudden loss of water during acute intestinal disturbances. That this is not a toxic or infectious condition is shown by the fact that when fluids are supplied the temperature immediately drops which eliminates the idea that the condition is due to the absorption of poisons in the meconium.

The picture of inanition is very characteristic, the skin rapidly becomes dry and inelastic, the mucous membranes are dry, the infant is fretful and grows weaker gradually, the vigorous cry of the normal baby becomes a feeble whine and if the condition is not recognized at once and relieved by plenty of fluid, death will occur.

Wet Nursing. With the complicated machinery of modern living the practical obstacles in the way of wet nursing have increased until the old, sound, substitute for mother's milk, the milk of a wet nurse, is often never considered for the infant in need of it. Artificial feeding has become so exact and successful a method of feeding the infant, and clean milk has become so possible to demand and secure in all progressive communities that the wet nurse is seldom considered an absolute necessity, but is regarded more as an expensive luxury. Besides, to place the average available wet nurse and her child in the average home demands a courage few possess as the psychology of such a situation is complex as a rule. However, all such obstacles are possible of adjustment and should never be allowed to stand between the baby and breast milk if that is what the baby needs. When the importance of breast milk is more fully appreciated such obstacles will never be recognized as barriers because infant life must not be lost by removable obstacles.

Some infants such as the prematures cannot live without breast milk from the very beginning and every hospital meets this problem—the premature baby in the ward, who must have breast milk, or the infant who has been pulled down to the danger level of digestion by previous illnesses acute or chronic that have necessitated long stays in the hospital and in many ways affected the general well being of the infant. We find infants who have suffered from long continued wrong feeding and breast milk is the only food that will save them. Often just the giving of breast milk for two or three feedings out of the whole will suffice.

There are certain definite principles which should guide one in choosing a good wet nurse:

1. The character of the nurse is important, not her moral character but her temperament, whether she will fit into the household and adapt herself to the situation.

2. A woman of phlegmatic rather than a nervous disposition usually makes a better wet nurse, because of the bad effect of high strung nerves on milk secretion.

3. A wet nurse should always have had a thorough physical

examination. There should be a very careful examination for any evidence of tuberculosis. There are some types of tuberculosis, for example tuberculosis of the knee or the hip, etc., which might not preclude a woman from becoming a wet nurse. If she has pulmonary tuberculosis, however, it makes no difference how well she may be supposed to be healed, she should never be recommended. A Wassermann reaction should always be demanded as well as a careful history of miscarriages. If the wet nurse comes from a hospital, inquiry should be made as to placental examination. The question of syphilis is an important one. If the baby to be nursed is luetic or syphilitic a luetic nurse is the only one to nurse it. In other words, if you have a luetic baby to be nursed at the breast, your object is to find a wet nurse that has syphilis. If you have a baby who is not luetic, you must find a nurse who has not syphilis. If the milk is pumped, then it makes very little difference for the syphilitic baby whether the milk comes from a luetic or a non-luetic mother. The danger, of course, is from direct breast nursing. I would not recommend the breast milk of a luetic mother for a non-luetic baby though there would probably be no danger, if the mother did not have active syphilis. However, safety first is the best rule—I have known a well baby of a non-syphilitic mother who did not have sufficient milk to be nursed by a kindly neighbor who had an excessive amount but who had syphilis and the well baby became infected and died of syphilis. Inquiry should also be made as to gonorrhea. And a wet nurse with gonorrhea should not be used for direct breast feeding because of the danger of contamination though her milk may be expressed under proper sterile precautions of the hands and breasts.

4. The health of her own baby is probably the best indication as to whether the wet nurse will be able to nurse another child successfully. Her infant should be thriving and thus reflect the quality of the milk. The age of either the foster or wet nurse's baby makes but little difference since the qualitative changes in milk vary but little with the duration of lactation.

5. A careful examination of her breasts as to glandular tissue, type of nipple, general hygienic condition of her breasts, as well as intelligence on general hygienic care of herself and baby are important. I have put the intelligence of the wet nurse at the bottom of the scale instead of at the top as most people do. A moron wet nurse is just as capable of producing good milk as a higher type of intelligence. She will not pass on her feeble-mindedness through her milk. Many mothers object to a wet nurse of low grade intelligence for fear the child will become an idiot. Neither the color, race, creed, morals, nor intelligence

of the wet nurse make any difference in her milk nor to the infants nursed.

The management of a wet nurse, when one is employed is often a delicate question and requires much diplomacy. Her diet should be carefully regulated. It is safest to continue on the diet to which she has been accustomed, if it is sufficiently nourishing. A sudden change of diet not only often upsets the wet nurse and her own baby, but makes it impossible for her to nurse

Fig. 37.—Best type of breast pump and breast milk obtained from one pumping of both breasts of an excellent wet nurse.

a second delicate baby. A wet nurse should always keep her own baby with her, even if she must gradually wean him. This keeps her more contented and also keeps the breasts better drained. As far as possible the wet nurse should be allowed to lead the kind of life to which she is accustomed. The transition from a working to a sedentary life, like a change in diet, might well have an injurious effect on the milk.

In certain cities, like Boston, Wet Nurses Bureaus have been developed where wet nurses are kept and breast milk furnished for hospital or private use. This lessens the expense for a family as the cost of such milk does not equal the cost of adding a

mother and her baby to the household and it avoids the necessary social adjustments of such an inclusion. In the University of California Hospital, I have been able to work out through our nursing follow-up system, the obtaining of breast milk from mothers who have an excessive supply. The follow-up nurse knows the home conditions and teaches the mother how to express the milk with absolute cleanliness. In many instances it is better to have the mothers come to the hospital daily and express their milk under supervision. In this way no risk is run as to the honesty and cleanliness of the mother. These mothers earn a dollar a day at least and their carfare and very often more as they are paid ten cents an ounce for their milk, and this

Fig. 38.—Breast milk from same wet nurse showing total pumping for 24 hours in quart bottles; also same amount made up in nursing bottles for 24-hour feedings.

regular care and supervision of their milk often pushes the supply from ten ounces to sixteen ounces and in some instances to a quart daily (Fig. 37–38). We have many clean honest self-respecting women who are glad of this way of earning and who are taught by it the value of such service for others.

Weaning. We have discussed the urgent reasons for weaning an infant early in the nursing period. The next consideration is the question of the length of a normal nursing period when the mother has sufficient good milk to produce a normal thriving infant. Dogma has little place here as circumstances *do* alter cases, but careful study of many babies fed exclusively at the breast for a year and a half condemn such a prolonged

nursing period. Such infants are usually anemic and if untreated the anemia may result disastrously. The average American mother nurses her baby completely up to the 5th or 6th month and partially until the 9th month. Most mothers are forced to wean their babies by the 10th month. With the development and growth of the baby, the mineral and organic chemical needs of the body are continually increasing and even though a baby may be fat, the lack of sufficient iron in the mother's milk may affect the formation of the red blood corpuscles, or the absence of sufficient salts may cause rickets so commonly seen in malnutrition problems. It is better and wiser, therefore, to begin an early substitution of other foods with the breast milk before such conditions have a chance to develop. By the end of the first year the normal infant is well able to digest more complex foods and clinical experience proves that by the 7th month it is often advisable to begin such supplementary feeding and almost always by the 10th or 11 month.

There are, of course, times for weaning which are more favorable and propitious than other times but those times are to be determined by the condition of the infant primarily, of the mother secondarily, and of family plans or convenience not at all. Seasons of the year are accidental factors and bear only an indirect relation to the problem. Weaning means an adjustment for the baby, and therefore, should not be undertaken in the middle of an acute illness when all powers of digestion are apt to be affected, unless the upset is directly caused by the breast milk. Experience has shown that breast milk is not often the improper food for a baby sick or well, and a baby should never be taken from the breast unless the indication is clear that the milk is at fault. The old idea that hot weather is never the time in which to wean a baby is an exploded theory as the direct cause of the resulting diarrhea or upset is not the heat but the failure to so regulate the hygiene and care of the baby to meet the atmospheric conditions. A baby's ability to handle any food may be affected by both heat and cold if the general hygienic care is poor. Summer weaning is a risk only among those families where the proper hygiene such as bathing, restful sleep, and quiet for the baby cannot be assured and therefore, nursing through the hot weather is perhaps better even though the infant be in his second year by the end of the summer. Where the infant can have the proper management of all the hygienic and environmental factors, summer weaning need not be avoided if for any of the reasons discussed it should become necessary. To deprive a baby born in February of months of breast feeding

because the mother is eager to wean the baby before hot weather is quite unnecessary and always to be discouraged if the baby is thriving normally.

Babies who have been accustomed to the modified bottle feeding during their nursing period can slip more easily on to the undiluted cow's milk although it is always safer to dilute cow's milk to three-quarters strength until the baby has made the adjustment. This holds true for any age infant when weaning is to be instituted. The baby will do better at first upon a weaker dilution than he requires until the intestinal tract has met the new demands. But even gradual weaning

FIG. 39.—Method of manual expression of breast milk.

presents real difficulties. The baby may refuse the bottle if he thinks by fussing and crying he can get the breast and many a tired nervous mother gives in rather than face the struggle. But firm measures usually bring the best results and if the mother will allow some one else to give the bottle at regular intervals or will permit the omission of one or two feedings until the baby is starved into taking the bottle, the battle is usually quickly won. This procedure of starving the baby need not be at all dangerous to the baby if plenty of water is given and feeding by gavage administered.

Manual Expression of Breast Milk. (Fig. 39.) The best way to accomplish this is to express the milk by manipulation, which is preferable to the breast-pump method generally in use. Manipulation and massage empties the breast more effectively

and stimulates the secretion. The mother or wet nurse can be taught the method very easily. She should be seated comfortably near a low table. The container, which has been previously sterilized, is placed on the table so that the upper margin of the vessel comes just beneath the breast. The palm of the left hand is placed either below or above the breast and gentle pressure exerted, thus forcing the milk through the duct toward the nipple. With the balls of the thumb, index and middle fingers of the right hand, a sweeping motion is made from the outer margin of the areola to the base of the nipple, thus forcing the milk out of the nipple. The nipples themselves should not be pressed and no pressure should be painful. The first time this method is tried

FIG. 40.—Wet nurse obtaining milk by using breast pump. This is the wet nurse who produced a quart and a half of breast milk a day besides nursing her own baby.

the mother or wet nurse may be nervous or afraid and it may take a few minutes before the milk will begin to come but a little patience and effort will overcome this.

When the mother is in bed, she should be turned on her side and the sterile container placed under the nipple. The nurse may carry out the above procedure if the mother or wet nurse is unable to do so. However, after a little practice most mothers become expert in this method. The breasts are less likely to become sore or infected by manual expression than by the customary method of using a breast pump, which is often very painful and may lead to infection and sore nipples.

The Breast Pump. The best type of breast pump to use is the English Pump with a glass bulb reservoir. This type of

breast pump can be sterilized by boiling. It is important in using a breast pump to see that it fits accurately over the nipple and that the suction is not too strenuous. If suction is applied gradually, milk is more likely to come steadily and cause less pain (Fig. 40).

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CHAPTER VII

MILK

Study of Cow's Milk.
Comparative Analysis of Human and Cow's Milk.
Protective Production of Cow's Milk.
  Certified.
  Pasteurized.
  Boiled.
  Loose.
Prepared Milk: Dried.
  Condensed.
Prepared Foods.

Composition and Character of Cow's Milk. When an infant fails to thrive on breast milk or for any reason the mother's milk is not available, the milk of cows is the usual substitute. Milk, therefore, must be made safe if it is to be used as food for infants. Poor or bad milk is responsible for many disasters of infancy and childhood. Such diseases as tuberculosis, typhoid fever, diphtheria and especially diarrheal diseases are easily transmitted through cow's milk. These bacteria vary in character according to the conditions under which the milk is produced and handled. The common variety of organisms found are the staphylococcus, streptococcus lacticus and organisms of the colon group. There is a great variation in the contents of milk from different types of cows. The milk of Jersey cows is not well adapted for feeding the average infant because of the high percentage of fat (5 to 6 per cent). The milk of Holstein and Ayrshire cows has a much lower fat content, from 3 to 3½ per cent and therefore, is in greater demand for infants. Even this milk is too low in fat content to be ideal but by breeding processes this percentage has been brought up to 4 per cent which is the ideal degree of fat. The most satisfactory milk is produced by mixed herds as here the fluctuations in the milk content of a single cows are wiped out and the constituents are more nearly constant. As the average dairy milk is from such mixed herds, the fat content is fairly constant, and many cities and towns require by law a certain fat percentage.

The constituents and the bacteriological contents of a modern city are strictly regulated by the Board of Health. The average per cents are as follows:

Fat 3.5 to 4 per cent. Sugar 4.5 per cent. Protein 3.5 per cent.

If the whole cow's milk undiluted is fed, most babies will suffer markedly, they will either vomit or it will produce colic, at first they become constipated and then often develop diarrhea. A few babies will take cow's milk undiluted without bad symptoms but even these do not gain weight as a normal baby should. When one examines the differences between human and cow's milk, some of the reasons at once become apparent, others have only been discovered after many years of study.

	Fat	Sugar	Protein	Salts	Calories per oz.
Human milk......	3.5–4.0	7.5	1.25	0.25	20
Cow's milk.......	3.5–4.0	4.5	3.5	0.75	20

The Quantitative Differences between human milk and cow's milk lie mainly in the larger quantity of sugar in human milk, 7 per cent in human milk to 4.5 per cent in cow's milk, and the large quantities of salt and protein in cow's milk. Salts in human milk are from .25 per cent to .30 per cent. Cow's milk salts are from .75 per cent to .80 per cent. The proteins in human milk are from 1.25 per cent to 1.50 per cent and in cow's milk are from 3.20 per cent to 3.5 per cent.

The Qualitative Differences are far more important than the mere quantitative differences. Milk sugar or lactose is exactly the same. The fats differ in that in cow's milk the size of the fat globules is large. Cow's milk also contains an excess of volatile fatty acids which are more irritating and have a higher melting point. These qualitative differences in the fats put more of a strain on the baby's digestion and together with the high salts found in cow's milk especially the calcium phosphates tends to produce the soap stools which are characteristic of bottle fed babies. These soap stools are formed by a combination of the calcium salts, the proteins and the fats which form larger bulk mass of stools and often produce the constipation characteristic of the bottle fed baby.

While the calcium and magnesium are increased in cow's milk, iron, though quite low in human milk, is still lower in cow's milk and this fact necessitates the earlier addition of foods, containing iron or foods that stimulate the iron production in the body, for the bottle fed baby than for the breast fed baby. The potassium salts are also diminished in cow's milk.

Studies with salts are increasingly bringing out the importance of the right balance between certain salts, this balance being just as important as the total quantity, perhaps more important. This balance of the salts is the main factor in keeping the right reaction for the body fluids and cells.

The proteins differ even more qualitatively. The soluble lactalbumin which represents over 60 per cent of the protein in human milk is reduced to about 25 or 50 per cent in cow's milk. The insoluble casein which is so much in excess in cow's milk representing about 60 per cent of the protein of cow's milk, is the protein which unites with the excess of calcium salts, and is less digestible or harder to absorb than the lactalbumin. The fact that casein when it is precipitated forms large tough curds has brought about certain procedures to prevent the formation of this large and bulky curd which is composed of calcium paracaseinate. If the milk is boiled previous to the addition of rennin (the stomach enzyme or ferment) a much finer curd results. This curd resembles more closely the curd of breast milk and this is one of the reasons why so frequently in artificial feeding, cow's milk is boiled—the other reason being to free the milk from harmful bacteria as already stated. Another method often used to prevent the formation of this tough curd is the addition of cereals. Cereals have a colloidal or buffer action in the matter. Sodium citrate added to milk produces somewhat the same results; a finer curd—because some of the citrate unites with the calcium forming citrate of calcium. The addition of lime water which was formerly so extensively used, has been more or less discarded because the effect of lime water is brought about by neutralizing the hydrochloric acid secreted by the stomach and so necessary for the rennin action. The lime water therefore always delays the rennin action and so, theoretically produces a smaller curd, but practically such a large quantity of lime water must be added that it is not as feasible as other methods. Besides this, lime water tends to increase the total amount of acid produced by the stomach. The caloric value of average cow's milk is approximately 700 calories to the liter or 70 calories to the 100 cubic centimeters.

Vitamines. In our study of milk as the main factor in infant feeding, we must consider the subject of vitamines in their relation to milk. The study of vitamines has demonstrated their importance in the proper growth and development of the baby. The presence of vitamines in milk cannot be shown under the microscope or in a test tube as other milk constituents are capable of being, but the absence of vitamines shows quickly in the baby's clinical picture as shown by laboratory methods.

There are three principal vitamines present in normal human milk, Fat Soluble A vitamine, Water Soluble B vitamine, and Vitamine C. Fat Soluble A vitamine is the vitamine soluble in fat, and therefore, is probably in combination with the fat. This vitamine has to do with the proper growth and development. Its absence is claimed by some to have a definite relation to the presence of rickets. This is probably not exactly true but it can be proved by laboratory experiments on animals that their normal development and growth can be definitely affected by the absence of Fat Soluble A. This vitamine in cow's milk is present only if the cows are being fed with fodder that is rich in Fat Soluble A which fortunately most green fodder has in abundance. Milk obtained from cows fed on dried fodder which is poor or lacking in Fat Soluble A will have an insufficient amount of this vitamine as Hess of New York in his studies on rickets shows.

The second type of vitamine, Water Soluble B, is related to the growth and proper maintenance of the body functions, especially the nerves, as when this vitamine is absent or deficient, the disease known as beri-beri is produced. Beri-beri has as part of its symptoms a peripheral neuritis and pseudo paralysis. Water Soluble B is found in fresh milk, fresh meat, yeast, fruit juices, the germ of the cereals as wheat germ or rice germ.

The third type of Vitamine C, anti-scorbutic vitamine so-called because its absence produces scurvy, is found in great abundance in fresh fruit, most green vegetables, tomato juice and fresh milk if the cows have been properly fed.

With the differences between human and cow's milk clearly in mind and the importance of the vitamine content understood, we are better prepared for the task of modifying milk for the needs of actual cases. We have found that the low proportion of sugar as compared with protein in cow's milk is the cause of the constipation of bottle-fed babies. Our first problem then is to affect in some way this proportion. The most generally used method of milk modification is the simple dilution of milk and the addition of sugar. If you dilute whole cow's milk by adding an equal amount of water, the amounts of the ingredients would be just one-half that of whole cow's milk that is 2 per cent Fat, 2.25 per cent sugar, 1.75 per cent protein, 35 per cent salts. Such a formula would be satisfactory except for the low sugar content and this is usually corrected by adding sugar to 5 per cent which is advantageous for two reasons, first, because it raises the caloric value, and second because it makes the proportion between protein and sugar more nearly correct. Most infants will do

better on a low fat percentage so that the addition of cream is not necessary. If cream is added, the total percentage of fat should not be above 4 per cent as infants with higher fat percentages are prone to develop fat constipation which might be the beginning of a serious nutritional disturbance. Nor is it usually advantageous to add an excess of sugar as this would result in a severe diarrhea.

This simple dilution formula does not represent an attempt to reproduce breast milk, for although the percentages may approximate those of breast milk, the qualitative differences cannot be affected. Experience, however, has shown that such simple dilutions are well tolerated by most infants.

As even pasteurized milk is sometimes contaminated before used, it is safer to boil such milk before feeding to infants. Under the most clean and careful procedures, raw cow's milk will contain from 100 to 1,000 bacteria per cubic centimeter after pasteurization and will have reached 50,000 by the time it is used, so that any break in the chain of protection of the milk can make bad milk of it whether it tastes sour or not, or whether it has come from the most model of dairies. Pasteurized milk that becomes contaminated is usually worse than raw milk that becomes sour because the contaminating organisms are more productive of putrefactive changes than the lactic acid bacteria of sour milk.

Certified Milk is the milk of carefully selected cows free from tuberculosis and produced under special regulations which include periodical examinations of all employees who handle the milk. It is true that the tuberculin test if properly carried out and all reacting cows removed, will protect against the germs of bovine tuberculosis. Every stage of production is strictly regulated, the milk is iced immediately and kept so until delivered. All regulations as to handling and delivery have all been worked out by the medical milk commission. But tuberculin testing and periodical examinations of employees does not completely safeguard against the introduction of infectious organisms and too many epidemics of sore throats, scarlet fever, diphtheria, dysentery and typhoid have been reported in connection with the use of certified milk to make one feel secure. All milk whether pasteurized or certified should be boiled before giving to infants or children under five.

Pasteurized Milk. Most cities require milk to be pasteurized, that is heating milk to a temperature of 140° to 150° F., and holding it at that temperature for a period of thirty minutes, then rapidly cooling it to 50° or under, and holding it at that temperature until delivered. Correct pasteurization destroys

disease germs and also a sufficient number of lactic acid organims to retard souring but not to prevent it, hence the necessity for keeping pasteurized milk cool until used.

Loose Milk or bottled milk sold in bulk from large cans should never be used for infants unless no other milk is obtainable and it should always be boiled.

Boiled Milk. In all these simple dilutions the use of milk boiled for five minutes minimizes the danger of diarrhea and other digestive upsets besides destroying harmful bacteria. The nutritive value of the milk is not affected and infants do just as well as on raw milk if care is given to add the necessary amount of orange or other fruit and vegetable juices to the diet in order to prevent the development of scurvy. A straight boiled milk diet for long periods may produce scurvy as the anti-scorbutic element is destroyed. In pasteurized milk this element is definitely diminished. The probability is that the vitamines are also affected but both the anti-scorbutic and vitamin elements can be supplemented by the giving of fruit juice and vegetable juice (tomato) and whole cereal diluents. The fruit and vegetable juices are used as anti-scorbutics while the whole cereal and vegetable diluents supply the necessary vitamines. The additional use of cod-liver oil in small quantities early will prevent the appearance of rickets which are often laid at the door of boiled milk. The advantages of boiled milk outweigh so greatly its possible disadvantages that it has now become a custom to boil all cow's milk before feeding to infants.

Condensed Milk is of two kinds, the sweetened and the unsweetened. Cow's milk boiled down to a smaller volume and sealed in airtight cans is the evaporated milk on the market as unsweetened condensed milk.

The condensation of the milk consists in boiling the milk down about two and one-half times, four and a half quarts of milk is boiled down to two quarts. As long as the cans are not opened, this evaporated milk remains intact but if opened, it will sour just as rapidly as any other milk. Unsweetened evaporated milk is the most convenient substitute for fresh milk and the dilution of evaporated milk with water in the proportion of one to two and a half is approximately of the character of ordinary cow's milk.

Sweetened Condensed Milk is the more widely used form of evaporated milk and it is made by adding a large amount of cane sugar to the evaporated milk so as to form a thick syrup. This milk may be preserved much longer than the unsweetened

because of the high sugar content which inhibits bacterial growth, but it is often not sterile and sometimes contains pathogenic organisms which grow readily when the milk is diluted. Sweetened condensed milk can be kept without ice and because of its simple diluting with water or feeding is very popular with certain classes. Condensed milk first came on the market as an infant food in answer to a demand for protection for infants from the dirty unsafe milk supply of cities and country towns, and before the methods of boiling, certifying or pasteurizing milk were practiced. The vague dangers of canned milk were to be preferred to the known dangers of dirty milk. Condensed milk babies often gain weight rapidly but they are almost without exception found to be flabby with poor tissue turgor and with little resistance to infections of all sorts, and usually subject to rickets. No magical dilution can make sweetened condensed milk a successful food for infants. The sugar content is too high and will cause severe diarrhea and other serious gastro-intestinal disturbances, or the protein and fat content are too low for the baby to thrive.

Sweetened condensed milk is costing the lives of hundreds of infants every year who if fed upon a properly diluted cow's milk formula might be healthy and thriving. The one fat thriving baby on sweetened evaporated milk is offset by dozens of babies who lose weight rapidly from the water loss incident to severe diarrhea. One wonders at the continued use of such a dangerous infant food but the education of the public is always slow. The sweetened condensed milk can is so convenient, the contents so alluringly simple of preparation, nothing needed but the addition of water before giving to the baby, the directions so much more easily read from a can than remembered from the doctor's conversation. Some doctors have given support to sweetened condensed milk feeding by claiming that under certain conditions infants require food with such a high sugar content. If that is true, the same result can be equally well accomplished by adding sugar to some well-watered cow's milk. The only excuse for ever using sweetened condensed milk is the absolute inability to secure any other kind of milk.

Dried Milk. One method of preserving cow's milk is to dry it to a powder. Dried milk is becoming one of the most popular and probably the least objectionable form of preserved milk. There are two methods used in the present preparation of dried milk: the roll method by which the milk is passed over very hot metal rollers, the water being thus evaporated and the dry

powder left on the rolls from which it is scraped; and the spray method by which the milk is sprayed under pressure into a very hot chamber or small room where the water evaporates rapidly and the powder falls to the floor. Some of the fat is usually removed from the milk before the drying process begins and in the spray method there is usually some concentration of the milk by boiling before spraying.

The changes in content of dried milk are first, a reduced fat content. There is also some change in the suspension of the fat globules when the dried powder is diluted with water. Second, there is some change in the taste of the milk but this is not much greater than is found in boiled milk. Third, the drying process increases the solubility of the calcium salts. There is much debate as to whether the vitamines and enzymes are affected in drying milk. As long as this is in question, I feel very strongly that the child fed on any artificial food should at the same time receive sufficient anti-scorbutics and the necessary vitamines as outlined in the use of boiled milk.

The advantages of dried milk are its small bulk; its practical purity as many tests place it in the certified milk class averaging about 6,000 bacteria to the cubic centimeter; its greater digestibility for many babies owing to the change in protein and the small reduction in the fat content; and the fact that dried milk can be easily diluted and almost any type of formula worked out for the baby's feeding. For traveling and for use in places where clean, fresh milk cannot be obtained or where milk, for climatic conditions cannot be easily kept, dried milk is the most serviceable substitute for fresh milk.

Infant foods. Many widely advertised patented infants' foods are on the market. They are of two classes; complete foods which require only the addition of water for use, such as condensed milks, sweet or unsweetened, and malted milks like Nestles' Malted Food and Horlick's Malted Milk, and foods which are intended to be added to diluted milk, such as cereal foods like Imperial Granum, Eskay's Food and Dennos Food. The complete foods are made up of partially evaporated milk with added carbohydrates, either sugar, starch or dextrins. The incomplete foods of the second group comprise all those foods with various mixtures of sugars, starches or dextrins. Neither of these types of infants' foods possess any advantage over simple mixtures of diluted whole milk and sugar and are all much more expensive. The chief reason why they are so widely used is because of the ease with which they are prepared and of the fact that directions for feeding them are usually supplied with each package.

At the same time physicians and nurses constantly meet intelligent and reputable physicians who use these foods with discrimination and meet with success in individual cases. Personally, I feel these foods may be of use *temporarily* in special cases but I have never seen the necessity of using these high-priced prepared foods continuously when the same results can be obtained with the modification of cow's milk. When these foods are used for any length of time, fresh fruit juices must be given because these foods are very poor or totally lacking in anti-scorbutic vitamines. In speaking of these prepared foods, I am not including the cereal flours and special sugar which are regularly used in the modification of cow's milk, such as Mead Johnson's Dextri Maltose Sugar which is used as any other sugar and is advertised as such and not as an infants' food!

The danger of these prepared foods is that they are put on the market as foods complete in themselves with definite formulas for the various ages, thus totally ignoring a fundamental fact in infant feeding that every baby must be fed as an individual recognizing definite physiological principles. No one who has had a wide clinical and hospital experience could fail to see the pernicious effects of prepared-food feedings upon countless babies. The widely advertised successfully reared baby on a prepared food overshadows the great number who die as a result of indiscriminate and unguided use of such foods. The mother who gave her eight-months-old baby "just what it said to give on the package for that age" is known to all of us and so is the baby when infections strike home and the wrong feeding becomes sharply defined. We must always remember that the need for artificial feeding arose out of definite emergencies when the mother was unable to nurse her baby and the use of the modification of cow's milk is primarily to meet such an emergency. Dried milk has been developed to meet the emergency of no fresh milk obtainable as countries swept by wars have found themselves stripped of cattle and no milk available for their children. But prepared foods are never advertised as emergency substitutes but as glorious, easy, short cuts to having a fat, well baby, and the formulas given cannot be any but most general guides to the individual baby to be fed. We sometimes must meet an emergency situation with an emergency cure but we must never fail to recognize it as such and work for the establishment of a fundamentally sound working out of the needs.

One night during the retreat of the Allies in 1918, 30,000 refugee women and children crowded the platform of one of the great, gloomy railway stations of Paris. Hundreds of babies

crying with fright and hunger, mothers in the terror of that retreat had suddenly lost their milk and to satisfy the babies, were stuffing pieces of sweet chocolate into the little mouths. The emergency had to be met with anything we could get to make up milk formulas for those starving babies, condensed milk, milk powder, dried milk and even prepared foods were all pressed into service during that night and doctors and nurses did what was possible. No one thought they had adequately solved the food problem of those babies!

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CHAPTER VIII

ARTIFICIAL FEEDING OF INFANTS

Nurses as well as doctors are interested in the backgrounds of all subjects much discussed and differed upon by the medical profession. The subject of artificial feeding is one of those subjects and the history of it, entered into even briefly, is of great value to those who are constantly called upon to apply differing methods of procedure in the feeding of babies. There isn't any *one* way of feeding all babies but there is a one way of feeding a particular baby. The roads leading to that one way for that one baby are several and a description of those several roads is the history of artificial feeding. Remembering that artificial feeding was the effort to meet the emergency of the failure of the mother's milk or any other human milk to nourish the baby, it was natural and logical that Philip Biedert, of Germany, the father of modern infant feeding, began in 1869 with an effort to analyze the differences between Human Milk and Cow's Milk. He made two basic contributions to the subject—one was that the protein which he used synonymously with casein of human milk is less than half the protein of cow's milk and that second, these differences were not only quantitative but qualitative, that there was a greater ratio of fat to the protein of cow's milk than to the protein of human milk and that the casein or protein of cow's milk was more indigestible than that of human milk. He therefore reduced the casein by water and milk diluents and raised the nutritional value of the food by cream and whey and cream mixtures. The many deductions he made from these experiments we must pass by in our discussion. His real contribution to the whole subject is as stated, and his scholarly methods had lasting influence.

Twenty years later we find Dr. John Forsyth Meigs of Philadelphia the best known and most successful feeder of babies. He got his results largely by trying out different mixtures but he took from Biedert the importance of casein in cow's milk and made the amount of casein in human milk even lower than Biedert had made it, 1 per cent. In Meigs' effort to reproduce exactly human milk, by modifying fresh cow's milk, he worked out a mixture of 4 per cent fat, 7 per cent sugar and 1 per cent

protein which was to him an exact imitation and one to be fed to all ages of babies. He did not believe in constantly changing a baby's food and this formula given, which he made by the use of certain proportions of cream, sugar and lime water, met with great success among healthy normal babies. Meigs was much nearer the truth about the amount of casein in human milk and his exact formula spared countless babies from experiments that would undoubtedly have cost them their lives.

Dr. Thomas Morgan Rotch of Boston began to study the problems of artificial feeding of infants at about the same time as Meigs. Rotch believed as Biedert did that the cause of most of the digestive troubles of infants was the casein, and he used even lower amounts for very young infants than either Biedert or Meigs. But Rotch felt, as a result of the experiments at the Infants Hospital in Boston, that casein was by no means the whole story, that fat had to be reckoned with; and that the world of babies was a world of individuals with differing powers of assimilating and handling food, and that food given a baby must be capable of infinite variation in amounts of food elements to meet the individual needs. Upon this he based the so-called percentage feeding which takes into account these various differences and provides a method by which the differences may be accurately registered in the food mixture.

Our latest pictures of modern feeding have come from the laboratories—one might say have been builded upon the discoveries of the processes inside the baby himself with which, whatever the food mixture, the food has to meet. Widerhofer of Vienna, a pathologist, gave a long classification of the anatomic pathology of intestinal disturbances, attempting to trace them all to some structural defect, and his effort taught us that the changes in the baby, gastro-intestinal disturbances are those of function.

Then came Theodore Escherich, one of the first true bacteriologists, who in 1886 began the study of the baby's intestinal bacteria and what the significance of these bacteria was in the digestive processes, normal or abnormal, and what relation these bacteria bore, or what their action was upon the food in the baby's intestines. Escherich found for us the two sorts of normal intestinal flora, fermentative and putrefactive, and he showed how necessary bacteria are to normal digestion and what trouble they may cause. He made the great contribution to the whole matter when he proved that the types of bacteria living in the intestine are determined by the kinds of food fed. One group of bacteria will grow upon food high in carbohydrates, another group upon food high in protein, and too much of one or too little

of the other food factor causes a mix-up inside the baby resulting in serious trouble. Escherich's contribution cannot be overemphasized, and his urgence that to handle any abnormal intestinal disturbance we must have a thorough knowledge of the bacterial processes of the normal intestine, has proved itself advice of the most far reaching wisdom.

We see in our history thus far, how each man used the work of the man before him and pushed the whole subject a little further along with additional new angles and emphasis. About 1900 Czerny felt that too much attention had been given to the baby's food and intestines and not enough to the baby as a whole, so he stressed the importance of studying nutrition as a matter of general metabolism. To put a food mixture into a baby that would pass unchallenged through his stomach and intestines was not the whole picture, as it might not result in the best of influences on the baby's whole development. Czerny felt that fat, starch and protein were capable of producing injury, and that nutritional disturbance from food infected after it reaches the intestines and infection of the intestinal mucosa itself, are part of any comprehensive study of the whole picture of artificial feeding. Decomposition of sugar and decomposition of fat in the intestinal wall mean injury to the intestinal wall by fever, thus admitting bacteria or their toxins and we have alimentary infection, the acids from the decomposition of fat and sugar beginning the trouble. This discussion cannot be exhaustive, but is, I think, of value in indicating the background for our own detailed guide in artificial feeding.

From 1907 on, Finkelstein and his co-workers Langstein and Meyer have given new emphasis to different factors. Sugar up to this time had been going more or less its own sweet way. Attention had been strenuously focused on casein, then fat, then bacteria and acids. Finkelstein puts most of the blame for digestive and nutritional disturbances upon sugar. Sugar, he says, is most likely to ferment in a medium rich in whey and sodium salts. The cells of the small intestine have an antibacterial function to perform in order to prevent too great a bacterial growth, and whey salts repress this cell function, allowing sugar fermentation to take place. The acids from this fermentation injure the intestinal walls, and salts and lactose escape into the general circulations, and Finkelstein now regards the salts as the cause of the fever and symptoms of intoxication resulting. Finkelstein also brings a new classification to nutritional disturbances, making the clinical picture of first importance. Certain types of disturbances are caused by a certain combination of food and there are as many types of disturbances

as there are food combinations. Disturbed balance, dyspepsia, intoxication and decomposition are Finkelstein's four main clinical pictures so to speak, and all of these involve a form of primary sugar injury. To treat sugar fermentation, he gives a milk preparation that is very low in sugar and high in protein, and his mixture contains 2.5 per cent fat, 1.5 per cent sugar and 3.5 per cent protein and it is made by adding to equal parts of buttermilk and water a certain amount of finely sifted milk curd. This protein milk feeding has been a most important contribution but it is not a wholesale panacea for all digestive troubles. It is a new and thoroughly tested mixture with which to meet certain very clearly indicated conditions. It is not a form of feeding to be tried because one does not know what else to do!

With all these European contributions from the laboratories, many American contributions have resulted which have added much to our present knowledge. Benedict and Talbot, by their painstaking metabolic studies of hundreds of normal infants, have laid much of the foundation for our understanding of the basic needs of the growing infant. They have shown the amount needed for growth which must be added to this basic need and also the effect of activities of various types. They have proved conclusively that the small delicate infant needs more food for body weight than the large normal baby and that the active or crying, fretting child expends more energy or heat than the quiet, sleeping child.

Howland, Marriott and Holt have added to and clarified much of our conception of internal metabolism that is the life and growth of the tissue cells and body fluids. Howland and Marriott have conclusively demonstrated that the loss of water changes the balance of the internal secretions, and that during this water loss it is more difficult for these body cells to develop normally or indeed to live at all, if the loss of water is very rapid. Through their studies the word dehydration, which means loss of water, has assumed a more important meaning and the condition of anhydremia, which we will discuss later, becomes a distinct entity in which water loss changes the salt balance, producing a very rapid death of the cells known as acid intoxication because it tends to change the reaction of the body fluids from weakly alkaline to weakly acid.

The studies of Holt and his collaborators have pointed out the great loss of fat and other food elements during diarrhoea besides the water loss. Holt's practical application of infant feeding has become a nursery classic and has stimulated the whole subject of infant feeding in America.

In this brief outline of backgrounds for artificial feeding, I think we can see the broad lines upon which the whole subject rests. Each man makes a new contribution, recognizing the work of his predecessor or co-worker in the field, utilizing that which has gone before, seeing the strength of certain definite contributions, and the weakness of certain omission in the study, discarding good ways for better ways, partial views for comprehensive views, and this will continue to be the history of artificial feeding. As new avenues open up, new positions will be taken; as new factors enter in, old factors will be illuminated, or eliminated or re-valued. The normal, healthy baby growing and developing is the goal of infant feeding, and it is the test of every method.

Artificial Feeding of the Normal Infant. While the normal infant may at times be difficult to determine, we may take as a fair guide one whose weight does not differ by more than 20 per cent from the average weight of a breast-fed baby of the same age and who has no disease or intestinal disturbance of any kind. We know that many infants cannot stand as much fat when artificially fed as when successfully breast fed. We know that cream mixtures do not upset some infants while others are quickly and severely disturbed by such mixtures. This fact has made the use of simple dilutions of whole milk and added sugar the most common procedure, rather than attempting to increase the fat by adding cream to the milk mixture. The "usual" baby thrives on such easily prepared dilutions. When we meet the abnormal baby or the chronic or acutely sick baby, we meet the more intricate problems of artificial feeding where often the finest shades of adjustment and adaptation must be made to fit the formula to the needs.

Simple Dilutions of Milk. Cow's milk diluted to one-third strength is the most satisfactory dilution for the first two weeks of life. Delicate babies can take this dilution well, the number of calories any such weak infants need not being determined by the baby's size or strength alone. All increases in the strength of the milk dilution must be gradually made to avoid disturbance but by the end of the second month the infant takes half water and half milk, usually by the fifth month, two-thirds milk and one-third water and by the end of the first year whole milk. Sterile water is the first diluent to use, then cereal water for a month or so with a gradual use of 3 per cent barley water over several months and after that the strengthening of the barley water to 6 per cent. Sometimes cornstarch or wheat flour make a better diluent for some infants than barley. We must remem-

ber in this simple dilutions that the infant must be furnished with the wherewithal to keep up his nutrition, his heat supply, and to meet all his energy requirements. To make the artificial feeding exactly similar to a breast feeding is not the first or even the second consideration but to meet the infant's needs of growth and development without disturbance.

Sugar in Dilutions. The amount of sugar in human milk is 7 or 7.5 per cent and it is safe to assume that the average normal infant should not have any higher percentage of sugar. Diarrhea is the price of an excessive sugar intake, as we know, and too little sugar retards growth. Milk dilutions must therefore provide for 7 or 7.5 per cent of sugar. Cane sugar, milk sugar or malt sugar are all used in bottle feeding to increase the proportion of carbohydrate. Cane sugar is sweeter to taste and therefore has a certain disadvantage as it accustoms the infant to food unwholesomely sweet in taste. Malt sugar, which is a mixture of dextrin and maltose, is the most successful form of sugar to use in milk dilutions.

Nurses will find that physicians vary in the fractions used for diluents. Some always speak of the diluents in fifths, i.e, one-fifth, two-fifths, three-fifths dilutions. Others use the tenths, making up their dilutions as two-tenths, four-tenths, six-tenths, etc. Whatever the fraction used, it is easy to compute the amount of the whole milk needed for the total mixture. The only advantage in larger denominations is that finer variations are possible in the mixture. The calories can be easily estimated as—

One ounce of whole milk	= 20 calories.
One level tablespoonful of milk sugar	= 40 calories.
One rounded tablespoonful of milk sugar	= 60 calories.
One ounce of milk sugar	=120 calories.

Accessory Foods. With the knowledge of the importance of anti-scorbutic and anti-rachitic food factors early in the infant's diet, the baby fed exclusively on a milk diet for 8 or 9 months is rapidly disappearing from clinical experience. At least half an ounce of orange juice is given daily to a baby three or four months old, and scraped apple, tomato juice, prune juice are well tolerated substitutes. Some babies thrive on several ounces of such juices daily with the appearance of the first teeth when an infant is six or seven months old, showing that the digestion of more complex foods is being anticipated, cooked strained cereals should be spoon fed. Even if dentition is delayed some form of starchy food like farina should be given in addition to the milk but not in place of the milk. Meat broths and vegetable

purees should be part of the diet by the eighth month and several ounces may be given daily replacing an equal amount of the formula.

Number and Time of Feedings. Six feedings at four hour intervals day and night is the usual schedule for the normal bottle baby, i.e., 6 A. M., 10 A. M., 2 P. M., 6 P. M., 10 P. M., 2 A. M. This last middle of the night feeding should be given up by the beginning of the third month if the baby is gaining satisfactorily and sleeping soundly without waking. Often if water is given at that time, the infant may be satisfied with just water. The *infant* is the guide in this, *not* the schedule. Water should be given freely to infants between feedings, specially during hot weather when water absorption is more rapid. Thompson says that an infant requires four times as much fluid for his size as an adult, in sickness and in hot weather even more.

Feeding Amounts. The amount of milk mixtures given and tolerated by infants vary to some extent with the size, vigor and age of the individuals to be fed. The same age does not necessarily mean the same amount of food nor does the same baby handle the same amount at all times. But the normal breast-fed infants offer the basis for the average figures for the bottle fed babies but even these figures leave margins for the adjustment of individual idiosyncrasies. What the baby does with the food is the only guide.

During the first 12 hours of life, little but sterile water is taken by the average infant. Then if the baby is to be completely artificially fed, a small feeding ⅓ of an ounce of the ⅓ milk and boiled water dilutions should be given and if several such feedings are well tolerated the amount offered may be increased to ½ an ounce. The increase in amounts should not coincide with an increase in the strength of the dilution. The maximum feeding at a year of age of any mixture is 8 ounces so that the gradual increase in amounts may be worked out with most careful consideration of each infant's need. The average baby will take 3 ounces at a feeding when two weeks old, and so on by gradual increases until the amount is 7 ounces at 6 months of age, et cetera, until the maximum 8 ounces is reached, which should include the amounts of cereals and purees given as well. The average estimate of amounts is based on caloric needs and these needs *gradually* increase, which is the common sense reason why formulas should not be constantly juggled with *before* feeding any more than infants should be bounced about after feeding.

The following table is based on the general principles considered above.

OUTLINE FOR THE FEEDING OF THE *NORMAL* INFANT

Age	No. of Feed-ings	Ounces at a Feed-ing	Dilutions of Whole Milk	Diluent	% Sugar Added	Approx. Calories per Day	Additions
Birth -2 da...	6	1/3 to 1	3/10, 2/5, 1/3	Water	6	50-100	Orange Juice
4 da. -1 wk ..	6	1 to 3	3/10, 2/5, 1/3	Water	6	200-300	....
1 wk. -2 wks .	6	3 to 4	4/10, 2/5, 1/3	Water	6	300-400	....
2 wks.-1 mo...	6	4 to 5	5/10 to 1/2	Water	5	400-500	....
1 mo. -2 mo...	5	5 to 6	5/10 to 1/2	3% B.W.	5	500-600	....
2 mo. -4 mo...	5	5 to 6	6/10, 3/5, 2/3	3% B.W.	....	500-600	....
4 mo. -6 mo...	5	6 to 7	6/10, 3/5, 3/4	6% B.W.	4	600-700	Cereals and Vegetables
6 mo. -8 mo...	5	8	8/10, 4/5, 3/4	6% Gruel	3	700-800	....
8 mo. -10 mo..	5 to 4	8	Whole Milk	None	0	800	Beef Juice-Zweibach

No such table, one might say, is "fool-proof." We are constantly finding the baby who does not fit such a table by a wide divergence. Many infants may thrive on more food or less food, as upon mixtures increased more rapidly in both amounts and strength, or upon mixtures increased more gradually. Sometimes a baby will persist in taking less in amount at some particular feeding. If the discrepancy is added to the other feedings this need cause no great anxiety as the total quantity given a baby in twenty-four hours is of far more importance than either the number of feedings or the size of any *one* feeding.

How to Calculate a Day's Feeding. Suppose we are to feed a normal infant of six months who has doubled his birth weight of 7½ pounds (3.4 kilos) and who now weighs 15 pounds (6.8 kilos). According to our schedule he should have 5 feedings of 7 ounces, one every four hours through the day or 35 ounces in the 24 hours. He can take 2 parts of whole boiled milk and one part of barley water, i.e., 23 ounces of boiled milk and 12 ounces of 6 per cent barley water (6 gms. B. to 94 c. c. water). We must add sugar to bring up the calories, 3 per cent sugar of the total mixture will be sufficient, i.e., .03 x 35 or 1 ounce.

We would write out such a formula as follows:

	Ounces	C. C.	Calories
Whole boiled milk......................	23	345	460
Barley water...........................	12	180	72
Sugar	1.0	15 gms.	120
Five feedings of 7 oz. each total......................		652	

(A calorie represents the unit of heat which is the basis of all

estimates of food energy—a calorie representing the amount of heat necessary to raise 1 liter of water 1° Centigrade.)

In studying a formula one must have in mind a background of the caloric needs of the infant and caloric values of food. To calculate the total calories and the calories per kilo or pound of body weight is always advisable in planning a formula. Whole milk has a caloric value of 20 to the ounce, sugar 120 to the ounce and starch 100 available calories to the ounce. For the infant considered above the total calories of 652 would be a little less than 100 calories per kilo or 45 calories per pound. This small amount of 23 calories may be easily made up by giving a tablespoonful of cereal. Young babies (especially those that weigh less than the average) need more than 100 calories per kilo—(such as premature and delicate babies).

This need is usually 120 calories to the kilo and may be as high as 150 calories to the kilo. These estimates have been arrived at through metabolism studies of infants which have taken into account the basal metabolism need, i.e., the minimum amount of food necessary to carry on life processes with the body at absolute rest plus the growth needs, plus the amount of energy used in average activities of the infant, plus that quantity of food lost in the stools. This is divided as follows: of the 100 calories, 60 calories or 60 per cent is estimated as the basal metabolism needs; 15 calories or 15 per cent is estimated for growth, 20 calories or 20 per cent is estimated for average activities, 5 calories or 5 per cent covers food loss. These estimates vary with the total number of calories required but the percentages remain approximately constant. If a young baby requires 120 calories, the percentage of growth calories, for instance, remains 15 per cent but the number of calories would be 18. If a baby has a diarrhea the loss of body excreta is more than 5 per cent; it may be as high as 50 per cent and this will affect the total requirement. Further modification on these average estimates is made in the infant whose activity is greater. Some babies in crying and kicking increase this average allowance of 20 per cent for activity to 30, 40 or even 100 per cent. In some instances it has been calculated as high as 300 per cent. It has been estimated that the optimum amount of whole milk for the average normal infant during the first year is about one-tenth of the body weight, or 1½ ounces to the pound. It will be seen that this is exactly the amount provided in the formula given above. If the formulæ are calculated for other ages, the results will be similar providing the infants are of average weight.

Preparation of a Milk Formula. Time and energy are saved and accuracy more easily secured if the total amount of feeding for a whole day are prepared at one time.

Barley Water. The diluent should be prepared first. Barley water made from the flour is the best. One pint of 3 per cent barley water is made from about 2 level tablespoonfuls (½ ounce) of flour mixed with enough cold water to form a paste, then the remainder of the pint of water is added and the mixture boiled for 20 minutes stirring constantly and allowed to cook for an hour in a double boiler. Then as some of the water has boiled away enough boiled water must be added to make up the original part. The mixture should be strained and cooled and is then ready to use. It will keep on ice for 24 hours if desired before using it.

System, cleanliness, scrupulous accuracy in weighing and measuring are the secret of successful modifications of milk in home or hospital. In making up a formula, first measure the required number of ounces of the barley water, then weigh the sugar desired carefully, stir it into the barley water until the sugar is entirely dissolved. In weighing sugar a medicine glass marked for the various amounts is better to use than the ordinary domestic spoon which is variable in size, while the glass in which the sugar may be shaken level is of standard marking. A *one* ounce table follows:

Barley flour....	4 level tablespoonfuls	Cane sugar....	2 tablespoonfuls
Wheat flour....	4 level tablespoonfuls	Milk sugar......	3 tablespoonfuls
Corn syrup.....	2 level tablespoonfuls	Maltose	3 tablespoonfuls

(Corn syrup quantity gives 1 ounce of sugar).

Next measure the milk, mix in the diluent and sugar, and proceed to sterilizing the whole mixture. There is a choice of sterilizing methods. You can sterilize the whole amount by boiling it in a saucepan for five minutes directly over a flame or you can boil it all for 30 minutes in a double boiler, adding boiled water to make up the volume lost, and then bottling the mixture, while hot, or you can bottle your mixture in the individual feeding bottles first and sterilize the mixture afterwards by placing the bottles in a circular rack in large covered pot containing a few inches of water and allowing the bottles to stay there for 30 minutes after the water in the pot begins to boil. The bottles should be stoppered with sterile cotton or boiled corks and cooled by running water before put in the refrigerator.

Our discussion so far has been of the method of feeding by simple milk dilutions. Another method of considering infant feeding is from the standpoint of the percentages of the ingredi-

ents, fat, carbohydrates and protein. This method of preparation of infants' food has the same aim as all other methods, as the caloric or simple dilution method we have discussed and that is the adaptation of food to the baby's needs. The percentage procedure is capable of finer variations of the ingredients and for this reason its advocates consider it better adapted to infant feeding than simple dilutions. The percentages make the formulæ more difficult to calculate but when these calculations are once learned it is comparatively simple to carry them out. There are two methods of calculating these percentages, a long and a short method, and I am not going to give the long method because I believe that the nurse who is going to constantly use the methods should master the long method by actual work in milk laboratories.

The short method of calculating percentages is much easier to understand and is advised for the nurse who is called upon to use the method. In the percentage method which is really not a method of feeding but a procedure for making the formulæ or food mixtures, there have been a number of short cuts in the calculations worked out, and perhaps the simplest of these short cuts is that discussed by Hill in his book on "Practical Infant Feeding" and a number of the tables I shall use are taken from this book. If one is interested in even a simpler method of calculation, the card prepared by Maynard Ladd of Boston gives the complete examples without the need of individual calculations.

The short method is divided into three steps. First, the determination of the amount of gravity cream needed for the formula. Second, the determination of the amount of skim milk needed and third, the determination of the amount of sugar needed. The amounts of the formula for the twenty-four-hour period are usually 16 ounces, 32 ounces or 48 ounces, although some doctors use more often the amounts, 20 ounces, 24 ounces or 40 ounces.

In the first step, multiply the fat factor (which will be found in table) by the per cent of fat desired. This gives the ounces of gravity cream needed.

The second step. The necessary skim milk is obtained by multiplying the protein factor (found in table) by the per cent of protein desired and subtracting from this amount the ounces of gravity cream already determined in step one.

The third step. The percentage of sugar in the ounces of gravity cream and skim milk "is always one and one-half times the percentage of protein desired."

The extra sugar needed is taken from the table.

FACTORS

	Fat Factor	Protein Factor
16 ounce mixture..........................	1.00	5.00
20 ounce mixture..........................	1.25	6.25
24 ounce mixture..........................	1.50	7.5
32 ounce mixture..........................	2.0	10.0
40 ounce mixture..........................	2.50	12.5
48 ounce mixture..........................	3.0	15.0

SUGAR TABLE

One level tablespoonful of lactose raises the sugar percentage

2.40 per cent in a 16 ounce mixture.
2.00 per cent in a 20 ounce mixture.
1.60 per cent in a 24 ounce mixture.
1.20 per cent in a 32 ounce mixture.
1.00 per cent in a 40 ounce mixture.
0.80 per cent in a 48 ounce mixture.

Example I. We wish to prepare a 16 ounce formula which will contain 2 per cent fat, 5 per cent sugar and 1 per cent protein.

Step I. 2×1 (1 equals the fat factor for 16 ounces) = *2 ounces of gravity cream.*

Step II. Skim milk 1×5 (5 equals the protein factor for 16 ounces) = 5 ounces of gravity cream, plus skim milk, $5-2=3$ ounces of skim milk needed.

Step III. Sugar already contained in gravity cream and skim milk is 1 (percentage of protein) $\times 1\frac{1}{2} = 1.5$ per cent sugar. This subtracted from 5 per cent of sugar which the formula calls for leaves 3½ per cent of sugar to be added, which, according to the table would be furnished by 1½ level tablespoonfuls of sugar of milk or lactose.

Step IV. To determine the amount of water needed, subtract the amount of cream and skim milk from the total quantity of the formula $16-5=11$ ounces of water or diluent to be added.

Example II. We wish to prepare a 32 ounce formula containing 3 per cent fat, 6 per cent sugar, 2 per cent protein. (This usually written out 3.—6.—2.)

Step I. $3 \times 2 = 6$ ounces of gravity cream.

Step II. $2 \times 10 = 20 - 6 = 14$ ounces of skim milk.

Step III. $2 \times 1\frac{1}{2} = 3$; $6-3=3$ per cent of sugar needed = 2½ level tablespoonfuls.

Step IV. $32-20=12$ ounces of water or diluent to be added.

Example III. We wish to prepare a 48-ounce formula containing a 3.5—7—2.5.

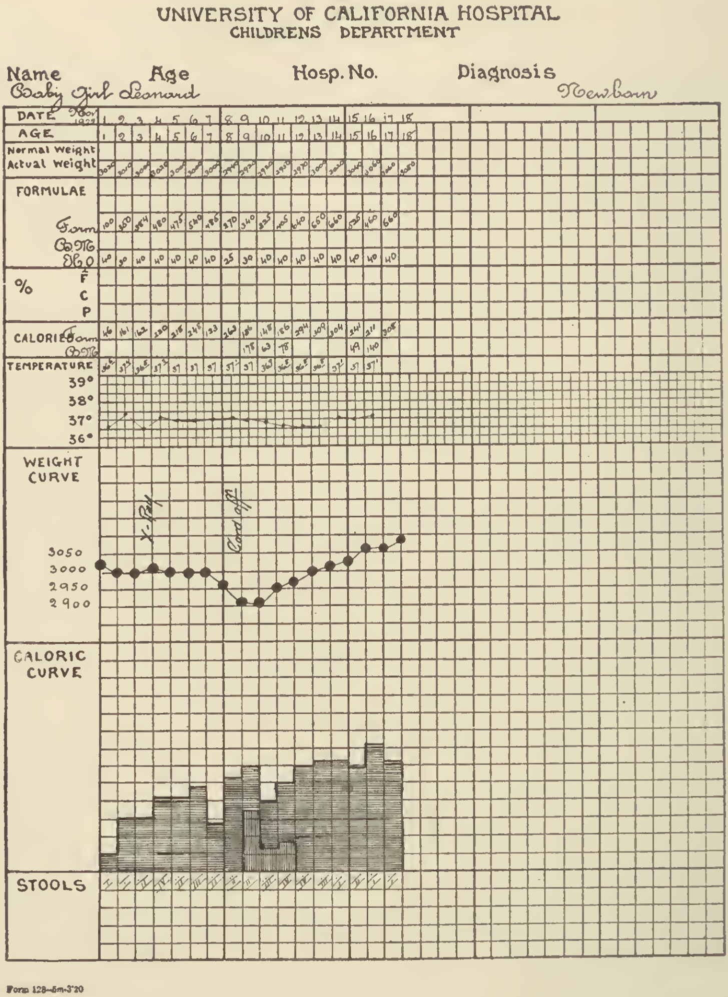

CHART 2.

Legend for

Baby Girl Leonard. (Hospital No.)

This chart shows a newborn chart in which the mother had no breast milk and artificial feeding had to be given from the start which was composed of a ⅔ formula with 6 per cent added sugar. The amount of formula and the caloric value of the food is given. The baby lost comparatively little but the gain in weight was slow. During the first week the child practically stood still. During the second week, after the quantity of the food was increased, she began to gain slowly but steadily.

This shows the difficulty of artificially feeding an infant from birth.

Step I. $3.5 \times 3 = 10.5$ ounces of gravity cream.

Step II. $2.5 \times 15 = 37.5 - 10.5 = 27$ ounces skim milk.

Step III. $2.5 \times 1.5 = 3.75$; $7 - 3.75 = 3.25$ per cent $= 4$ tablespoonfuls sugar to be added.

Step IV. $48 - 37.5 = 10.5$ ounces of water or diluent to be added.

The calories in these formulæ can be easily calculated by following an equation which Hill gives as being fairly accurate. The equation is as follows: The sum of twice the fat per cent in the mixture plus the sugar per cent (also the carbohydrate per cent if any cereal such as barley water is added) plus the protein per cent times $1\frac{1}{4}$ the total amount of the mixture. This written out is $2F + S + P \times 1\frac{1}{4}\ Q =$ the total calories in the mixture. If we take our first example we have the formula 16 ounces 2 F.—5 S.—1 P.

$$\begin{array}{r} 2\ F = 4 \\ 1\ S = 5 \\ 1\ P = 1/10 \\ 1\tfrac{1}{4}\ Q = 20 (16 + 4) \\ 10 \times 20 = 200 \text{ calories.} \end{array}$$

In Example II—32 ounces of a 3.—6.—2., the calories would be

$$\begin{array}{r} 2\ F = 6 \\ 1\ S = 6 \\ 1\ P = 2 \\ \hline 14 \\ 1\tfrac{1}{4}\ Q = 40 \\ 14 \times 40 = 560 \text{ calories in the 32 ounce mixture.} \end{array}$$

Example III—48 ounces of a 3.5—7.—2.5—calories computed.

$$\begin{array}{r} 2\ F = 7 \\ 1\ S = 7 \\ 1\ P = 2.5 \\ \hline 16.5 \\ 1\tfrac{1}{4}\ Q = 60 \\ 16.5 \times 60 = 990 \text{ calories in a 48 ounce mixture.} \end{array}$$

Whey mixtures are occasionally used. The idea of whey mixtures is to reduce the amount of casein and by adding cream and sugar the fat and sugar content is increased. Whey, we remember, contains fat 0 per cent, sugar 4.5 per cent, whey protein .90 per cent. Usually from 2 to 3 per cent of fat is added and in order not to dilute the whey protein per cent too much, usually a 24 or 32 per cent cream is used instead of the ordinary 16 per cent gravity cream. In whey mixtures—

When all the diluent is whey, whey protein is approximately..............................	.90 per cent.
When ¾ of the diluent is whey, whey protein....	.75 per cent.
When ½ of the diluent is whey, whey protein....	.50 per cent.
When ¼ of the diluent is whey, whey protein....	.25 per cent.

The protein in the added milk or cream is calculated as all casein. The percentage of fat and the amount of cream to be added are calculated in the same way as calculating the amount of cream in a percentage mixture, remembering, of course, that if 24 per cent cream is used instead of 16 per cent, one would add only two-thirds as much cream and only one-half as much cream if 32 per cent cream is used instead of the 16 per cent gravity cream. The amount of sugar added increases the percentage of sugar to the same extent in a whey mixture as it would in a whole milk or a skim milk and cream mixture.

Whatever the mixture the handling of it and the feeding of it to the baby demand absolute cleanliness and care of details.

Care of Feeding Bottles. The form of bottle is determined by the ease with which it may be cleaned, therefore a bottle with no angles, a cylindrical bottle of 8 or 10 ounce capacity with a narrow sloping shoulder is best. The obsolete rubber tube between bottle and nipple should not be tolerated because it cannot be cleaned. The bottles must be scrubbed before and after they are used with hot soapsuds and a bottle brush, then boiled for ten minutes.

Nipples should be of a type easily inverted and scrubbed in the same manner as the bottles, occasionally boiled, and left standing always in boric acid solutions.

Giving the infant his bottle should be as carefully done as giving the baby the breast. There should be absolute regularity in feeding and the mother or nurse should hold the baby while feeding and also hold the baby up several times during a bottle feeding and afterwards to allow the gas to escape just as in breast feeding. The bottles should be warmed to body temperature by immersing in warm water and this temperature should not be guessed at but tested by letting a few drops fall on the inner side of the wrist. The size of the hole in the nipple should bear direct relation to the infant's strength in sucking. It should be large enough to permit the milk to drop readily but not to run out. Twenty minutes is the limit for a bottle feeding, if more time is required the nipple hole is too small or there is something wrong with the baby. No food should be forced and all left over food should be discarded and never offered again to the baby.

Acute Intestinal Indigestion of the Artificially Fed Infant. The undernourished bottle-fed baby presents practically the same picture as the breast-fed baby who is undernourished; failure to gain in weight, the whining cry, the puny miserable looking baby with subnormal temperature as an average; in fact the whole picture of weakness, with growth and development struggling to take place through the wrong medium! In such cases there is no excuse for lack of knowledge of the amount of food the baby takes if bottles are carefully filled and feedings observed. The quality of the mixture must be analyzed and studied and with patience the right formula discovered and given.

The acute indigestion of the bottle-fed baby has the two main causes we noted in the breast-fed baby, overfeeding and faults in the quality of the milk fed. Absolute regularity of amounts of feeding and times of feeding must be carried out if we are to be sure of the quantity of food the baby is taking, and we must know that before we can attempt any adaptation of the formula.

The symptoms of acute indigestions of the bottle-fed baby practically parallel those for the breast-fed baby. Vomiting or spitting up may or may not occur depending upon whether the trouble is in the stomach or intestinal tract. Stomach irritation shows the curdy, acid condition in vomiting and frequent eructations of gas. The stools are passed four, five or six times a day and are filled with green curds and mucus of scraggly appearance. The character of the stools will vary according to the type of food. If the upset is due to too much sugar or starch the stools will be green, watery, bubbly or frothy with an acid fermentative odor. This stool often scalds the baby's buttocks. If the condition is due to excess fat, there are often pale, lumpy, oily looking stools following a previous history of constipation when the stools were dry and chalky in appearance. These loose fat stools will also excoriate the buttocks (Fig. 41).

There may be a good deal of distention from the formation of gas. The temperature is usually slightly above normal, 98° F. to 101° F., and will vary from day to day. The urine is concentrated with strong odor of ammonia and is irritating to parts. The baby is pale and flabby, restless and nervous, sleeps poorly and loses in weight consistently as a whole although with the same unevenesses noted above. Lowered resistance leads to the same susceptibilities to infections already described and the complications arising after the acute attacks of indigestion sometimes end fatally, especially in the baby under three

months of age. Severe intoxications occur and resulting malnutrition.

In the severe cases of the baby under three months, a return to breast-milk feeding is often found to be the only way to meet the condition. In all cases medicinal treatment is to be avoided and the hygienic conditions made as fine as possible. Absolute sterile cleanliness of diapers, plenty of fresh air and the careful adjusting of the fat and sugar contents of the food mixtures by the use of saccharin water, barley water, skim milk, malt sugar in simple milk dilutions usually bring the desired results.

Fig. 41.—Intertrigo buttocks.

The intestinal disturbances of breast- and bottle-fed babies are, we might say, of infinite variety and of endless shades of severity. The acute conditions and the chronic conditions are often difficult to dogmatically determine. A few trifling upsets now and then do not seem to mean very much the adjustment is made for the emergency, and the conditions apparently subside and the baby seems over it. Then there will be a sudden severe flare-up and when that subsides, we find chronic conditions in evidence or there may be no sudden big disturbance but the series of so-called slight acute attacks lead slowly and almost imperceptibly into a chronic condition of some kind that is most difficult to affect.

Often we meet the baby who is just improperly fed. He may weigh above the average and apparently be able at the moment to stand the wrong food mixture but such babies are not normal and for the sake of their future well-being must be started on the right road. In altering the food mixtures for such babies, we must begin with a weak formula which is gradually altered until it approaches the usual feeding for the age. The first formula given to such a baby should not be so very different from what he has been receiving, providing, of course, there are no serious digestive disturbances which require immediate reduction or alteration in the character of the food. The baby fed on condensed milk receives relatively little milk and considerable sugar, therefore the first formula given such a baby previously fed on sweetened condensed milk might well be started on a 4/10 whole milk dilution with 6 per cent added milk sugar. The amount of this formula given at a feeding should not vary by more than an ounce from the amount the baby has been previously taking unless that amount was obviously excessive. The dilution should be altered as rapidly as the child's digestion allows until the baby is finally receiving the usual feeding for his age.

If too frequent or too rapid changes are to be avoided in the normal baby, it is even more important to avoid such changes in the sick baby. Radical changes do of course have to be made at times when the actual feeding is increasing the acute conditions but it has always seemed absurd to me to make a practice of daily changes in formulæ. To daily increase the strength of any ingredient in the formula, or to daily increase the total amount of the formula is usually a disastrous proceeding because the sick baby cannot make such rapid adaptations and such fumbling makes it impossible to estimate his actual capacity. It is often difficult for those handling a baby to understand that slow results in this matter are better than rapid ones. You cannot undo improper feeding in a day or two, nor can you affect, in a feeding or two, acute conditions. Both the baby and the formula must have a fair chance.

Another type of infant closely related to this consideration of some of the simpler disturbances in feeding is the underweight baby, not an acutely sick baby or one showing any of the symptoms we have discussed but just underweight as the result of previous illness or bad feeding.

These babies require almost if not quite as much total food as normal babies of the same age. But, unfortunately, they are not always able to assimilate such amounts and we must

take into account the character of the previous feeding and their gastro-intestinal condition. The same care must be given to avoid sudden increases in the amount of any one constituent, and in the total intake. The aim should be to gradually increase the food until the normal average intake for the age is reached. Often an underweight infant can take the same strength food, although in somewhat less amounts than a normal infant. For example, a 6 months old infant weighing 9 pounds might be able to take a 7/10 whole milk dilution with barley

FIG. 42.—Nurse giving feeding to baby on porch.

gruel and added sugar. He might, however, be able to take only 5 ounces of this formula instead of the 7 ounces that a normal infant could take. The total daily food intake, however, for such an infant might to advantage be increased by giving 6 feedings instead of five per day. Fed in this way the infant might be taking as much as 150 calories per kilo of body weight, although the total caloric intake for the 24 hours would be somewhat below the average requirements of the normal infant.

Hot weather often is a factor in acute intestinal disturbances

and it is always to be remembered that during hot weather the baby requires less food, and his ability to utilize food is less. Water is an urgent need at this time, and it is usually best to feed a more diluted formula. A simple, practical method of accomplishing this is to pour out one-quarter or one-third of each bottle of modified milk and to replace the amount by water, during extremely hot days. It is also advisable to temporarily diminish the amount of sugar added to the formula. All babies should be freely offered sterile water between feedings.

In actual acute illnesses, the tolerance for food is lowered when fever is present and there is the same water requirement of hot weather conditions. The illnesses referred to here are those not directly involving the gastro-intestinal tract, but many parenteral infections exert a distinct influence on the gastro-intestinal tract of infants. At the onset of such conditions as pneumonia or acute otitis media, infants are likely to vomit and to suffer from diarrhea. The gastro-intestinal condition clears up quickly when the fever subsides, and is less serious than gastro-intestinal disorders due to grossly improper feeding.

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CHAPTER IX

VOMITING, CONSTIPATION AND DIARRHEA

Introduction. I would like at this point to discuss three conditions which occur as symptoms of many different acute and chronic diseases and to which we will refer over and over again in our discussions—vomiting, constipation and diarrhea. At the risk of some repetition, I would like to bring together here all we have touched upon of these conditions in previous chapters, and present a concise picture of these symptoms, and the treatment of them as both symptoms of disease and conditions in themselves, the causes for them and the usual progress of the conditions, especially in relation to our *nutritional* problems. These conditions are constantly met by both doctor and nurse in every feeding problem of infancy. The *usualness* of them should in no measure blur the significance of these conditions in each individual case. As constant factors in the feeding disturbance of babies, we must have definite general pictures of these conditions in our minds upon which to base the *nursing* observation of the case.

Vomiting is due to a number of causes which we may briefly state as, first, physical and mechanical causes; second, irritation of the stomach by food or drugs; third, increased irritability of the stomach arising from causes outside of the gastro-intestinal tract; fourth, habit or rumination; and fifth, functional or organic obstruction of the gastro-intestinal tract. These causes all produce very tangible evidences to help us in determining upon a course of action, the third group demanding, perhaps, the finer discriminations in our observations.

Vomiting as a mechanical protest. Slight regurgitation or "spitting up" is the natural protest of an overfilled stomach. When too large amounts of food are given the stomach protects itself by expelling the excess and the character of the expelling depends upon the amount of the excess. If great excess of food is present, the food will pour out of the mouth without effort, if only a little excess is present the so-called vomiting will be but a mild drooling of milk at the sides of the mouth. Such vomiting is a real safeguard to an infant from the serious consequences of overfeeding. Feedings at such frequent intervals that the

stomach is not completely emptied between feedings will cause overfilling even when reasonable amounts of food are given at a feeding or it may mean a stomach abnormally small, or it may indicate slower action of the physiological processes of digestion.

Gas or swallowed air in addition to food will cause vomiting unless care is taken in feeding the infant. The physiological reason for holding an infant in upright position while feeding is to allow the air bubble to rest at the cardiac orifice from where it may easily escape without taking the food with it. Holding the baby over the shoulder and patting him gently on the back during a feeding is the best way to prevent vomiting from gas or air. After the infant has belched up the swallowed air, he should be laid back in his crib as handling an infant after a feeding will often cause an otherwise normal infant to vomit.

Vomiting from stomach irritation. Unusual food, irritating or nauseating drugs, spoiled food or stomach fermentation of food, or the formation of large curds may all cause vomiting.

Too much fat in an infant's food will delay the emptying time of the stomach which will, in turn, render fermentation of food more likely, besides leaving food in the stomach. Excessive sugar rarely causes vomiting in the normal breast-fed infant and if sugar is kept at 7 or 7½ per cent for bottle feedings it will not cause vomiting.

Vomiting caused by conditions outside the gastro-intestinal tract. Sometimes vomiting will occur as part of the picture of an anaphylactic reaction which is not a true outside irritation but a constitutional reaction, peculiar sensitiveness to certain food factors, etc. Parenteral infections such as otitis media, pyelitis, pneumonia, contagious diseases with their accompanying lessened energy often weaken the digestive power and produce vomiting. Tumors, hemorrhage, meningitis all may produce severe vomiting which no diet will affect. Vomiting caused by uremia and "cyclic vomiting" are seldom found in infants.

Rumination. This condition may be the habit of strong or weak infants who are given too much milk and then relieve their overfilled stomachs by bringing up the surplus at will, with no apparent discomfort. The end result of the habit long continued is weakness and emaciation. This surplus is often held in the mouth and later swallowed or it is actually vomited. An infant highly strung or with a definite nervous heredity develops this habit more frequently. Sometimes the hands are put into the mouth to start the regurgitation of food or the infant will make some facial grimace and stiffen and arch his whole body as a preliminary symptom.

Obstruction of the gastro-intestinal tract is an occasional cause of vomiting. During early infancy hypertrophic stenosis of the pylorus is one of the most frequently encountered forms of obstruction as discussed in Chapter IV.

The **symptoms** may appear any time from within a few days after birth to the sixth week, but may be delayed as long as the second month. They usually occur during the first two or three weeks. Vomiting is the first symptom, at first occasional, then becoming habitual. It is abrupt and projectile in type, differing entirely from the ordinary vomiting due to overfeeding or to gas.

Fig. 43.—Pyloric stenosis showing peristaltic wave. Outline of the stomach can be seen just to the left of the median line and above the umbilicus.

There is a rapid loss of weight due to starvation. There is no fever and usually no pain, though the infants appear to have pain at times during the contraction of the stomach and expulsion of the food. Vomiting at first is directly after feeding. It may, however, be delayed for an hour or two after feeding when the stomach is dilated. At times the vomiting does not appear after every feeding, but may be delayed for several feedings, depending on the size of the stomach. There are no signs of indigestion, the child will resume nursing immediately after vomiting. The stools are small. They may be constipated in type, or be of a meconium character. The wasting of the child will indicate the

amount of the obstruction as will also the appearance of the stools. Peristalsis (Fig. 43) is always visible, especially at the time the child is taking food, just previous to vomiting. Waves can be seen running from the left to the right and then back up from right to left or reverse peristalsis. Reverse peristalsis is present immediately before vomiting, the epigastrium is full and the lower abdomen is sunken. The peristaltic waves are often very easily seen, especially if the infant is markedly emaciated. At times the pyloric ring can be felt during the spasm as a ball-shaped mass about 3 to 5 cm. in diameter, just below the costal border and just inside and to the right of the mammary line.

Pyloric obstruction may be either acute, subacute or chronic and depends entirely on the degree of obstruction. Where the obstruction is complete, the symptoms are very acute; when the obstruction is incomplete or partial the condition may be either subacute or chronic. The diagnosis is usually easily made. In the early cases, it may take several days of careful observation. In extreme cases the diagnosis is always easy. Peristaltic waves and the type of vomiting are the two most important symptoms. The general history of the vomiting is also important and suggestive. The outcome in true hypertrophic pyloric stenosis depends on how early the diagnosis is made and the method of treatment adopted (Chart 3).

The treatment may be either medical or surgical. Medical treatment consists of diet and stomach washing (Fig. 44). (See Harmer, pages 405–411.) Stomach washings are very important, not only from the standpoint of treatment, but also in the preliminary consideration of the case. Ordinarily, as has been stated, after breast-feeding the stomach is emptied at the end of one and a half or two hours. In cases of pyloric stenosis which have existed for any length of time, there is usually a certain amount of retention. A stomach tube (rubber catheter 22–26F) passed just before a feeding will indicate the degree of retention. Often there is a considerable amount of mucus which makes it difficult to empty the stomach contents, showing that there is a definite amount of gastric irritation. Washing out the stomach withdraws all the retained food and in the early spasmodic types this may give considerable relief and permit food to be passed through the pylorus. The water should be between 42 and 43° C. or from 107 to 110° F. It is best to have it slightly alkaline, using a 1 per cent solution of sodium bicarbonate. The washing should be done from twenty minutes to half an hour before feeding. It is often wise to allow a little of the solution to remain in the stomach. Sometimes these washings must be continued over a long period. For the same reason in these cases of

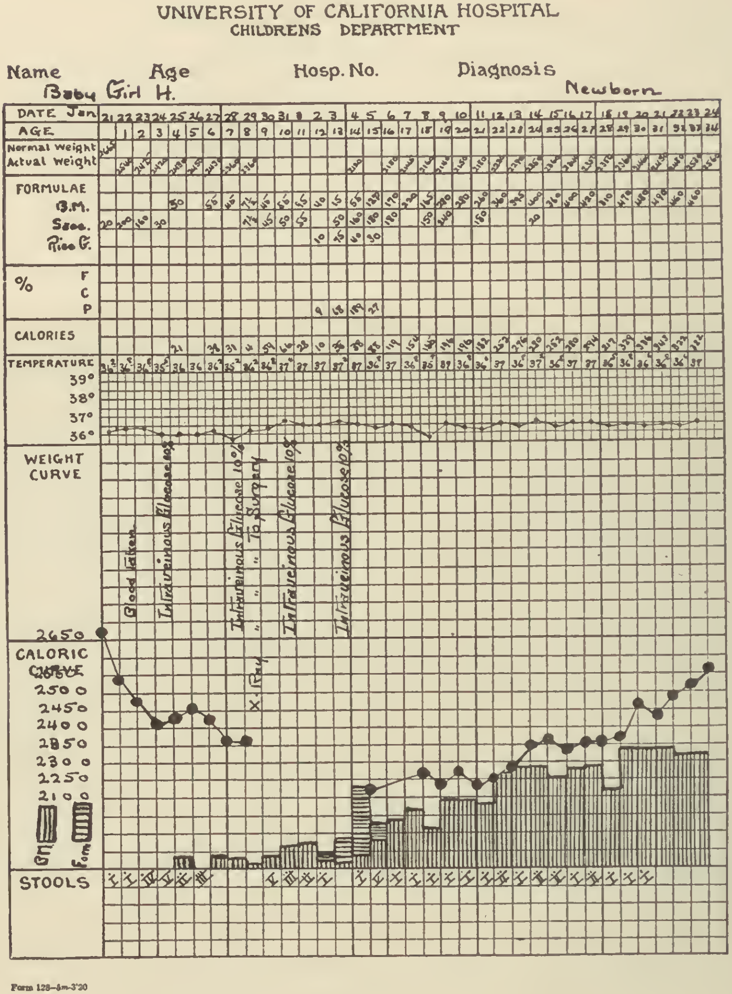

CHART 3.

Legend for

Baby Girl H. (Hospital No. 9743a)

(Newborn)
Diagnosis: Pyloric Stenosis.

This baby was born in the hospital with a birth weight of 2,665 grams (approximately 5¾ pounds). She started to vomit after the first feeding the first day and continued to vomit practically everything given throughout the first week. There were definite peristaltic waves, and the X-ray showed that practically no food went through the pyloric opening. From the seventh to the tenth day there were no bowel movements. The temperature was subnormal. Even with intraperitoneal and intravenous glucose injections she was losing weight rapidly. Operation disclosed a car-

marked pyloric spasm with mild hypertrophy, hot applications over the stomach will sometimes relax the spasm. In cases in which the pyloric spasm plays a large part, certain drugs such as atropin and belladonna may have a very marked effect. Since the introduction of thick cereal feedings, there has been a marked change in the outcome of the truly hypertrophic cases to medical treatment (Fig. 45). Almost any cereal can be used. Cereal feeding should be made up so thick that when it is cold it is practically a jelly and when heated it can be pressed through a large hygea nipple with a free opening, using a spoon or

Fig. 44.—Method of gavage or lavage.

spatula. Infants can take a sufficient amount of this thick cereal mixture with the appropriate dilutions of milk often to gain in weight. In a certain percentage of cases, varying from one-third to one-half, the results of such feedings are successful. This is particularly true if these feedings can be started early and the sphincter is not entirely obstructed. Where the hyper-

tilaginous pyloric ring. The Ramstedt-Frede operation was done. She continued to vomit a little for the next four or five days, during which time intravenous glucose solution had to be administered on several occasions and her water needs kept up by subcutaneous injections of saline solutions. The vomiting gradually diminished, and by the end of the first week after the operation, she began to take food well and started to gain. On discharge, five weeks after birth, her weight had returned to almost her birth weight, i.e. 2,560 grams (approximately 5½ pounds).

This case illustrates the type of pyloric stenosis which is undoubtedly congenital and not due to any spasmodic irritation.

trophy is extreme such feedings are not successful, and the child will continue to vomit and lose weight. The feedings should be small in amount and not too near together. Usually from two to three ounces of thick cereal, either from 12 to 18 per cent of a thick rice flour or barley flour, may be used. This should be diluted with just enough milk so that when warm it can be pressed through a large opening in the hygea nipple. It takes a great deal of patience to feed these infants. Very often they will vomit one feeding and if fed immediately after, will retain the second. It is usually best to mix the cereal with breast milk,

Fig. 45.—Method of feeding thick formula through hygeia nipple.

if this is obtainable, rather than with diluted cow's milk. When cow's milk is used, it is best to make the dilution with very low fat percentage. After feeding the infant should be placed in an incline position with one or two pillows under his back and his head rather high.

Acute cases of hypertrophy usually demand surgical treatment and this should not be delayed too long. It is unwise to delay operation in a case of hypertrophic stenosis which is losing weight. It is only justifiable to continue medical means for a few days in order to observe the case and see whether it may respond to this type of treatment. Where the vomiting persists and loss of weight continues, the sooner operative procedure is

instituted the better. It is always important to give the child sufficient water. If the child vomits water, as it usually does, the water must be introduced subcutaneously or intraperitoneally, and in cases where there is marked dehydration, infants will often absorb sufficient quantities of water by rectum, if this is given in small quantities and not too frequently. An ounce of water at a time introduced high up every three or four hours will often be absorbed. This, however, is usually not enough and salt solutions or glucose in salt solutions must be introduced intraperitoneally or intravenously through the longitudinal sinus. The operation is delicate. It has been stated as *the rule not to wait* until the child is unable to thrive before resorting to an operation (Chart 4).

The type of operation most used at present is that known as the Fredet-Rammstedt operation. The tumor mass is split transversely and sprung by introducing a hemostat. The mucous membrane is not cut. The operation does not require more than twelve to fifteen minutes, often it can be performed by a skillful operator, who is accustomed to this kind of work, in less than five minutes. The immediate danger from the operation is shock. This can be largely obviated if the child is carefully prepared. It must be emphasized that the child should have a large quantity of water several hours before the operation. The surgical risk is very much higher in a dehydrated child than in one who has had a sufficient quantity of water. These children are especially prone to develop broncho-pneumonia. The risk of post operative hemorrhage or sepsis, under skillful surgical technique, should be very small.

The post operative treatment is most important. The infant should be put in an almost sitting position, supported by pillows. Small quantities of feeding should be started very soon after the operation, usually within an hour, 5 or 10 c.c. of water can be given, and this can be repeated in increasing doses until two or three ounces of a weak formula are given every three hours. It is remarkable how soon these infants can take normal amounts of food and how rapidly they regain their lost weight and vigor. Following the operation the infant may vomit once or twice, but very often no vomiting follows a successful operation. At times there is a temperature rise in the first twenty-four hours but this usually does not continue unless there is some complication.

In some infants there is a congenital atresia of the small intestine especially of the duodenum, in others there may be congenital obstruction due to the presence of fibrous bands. Acute intestinal obstruction due to such causes as intussusception or

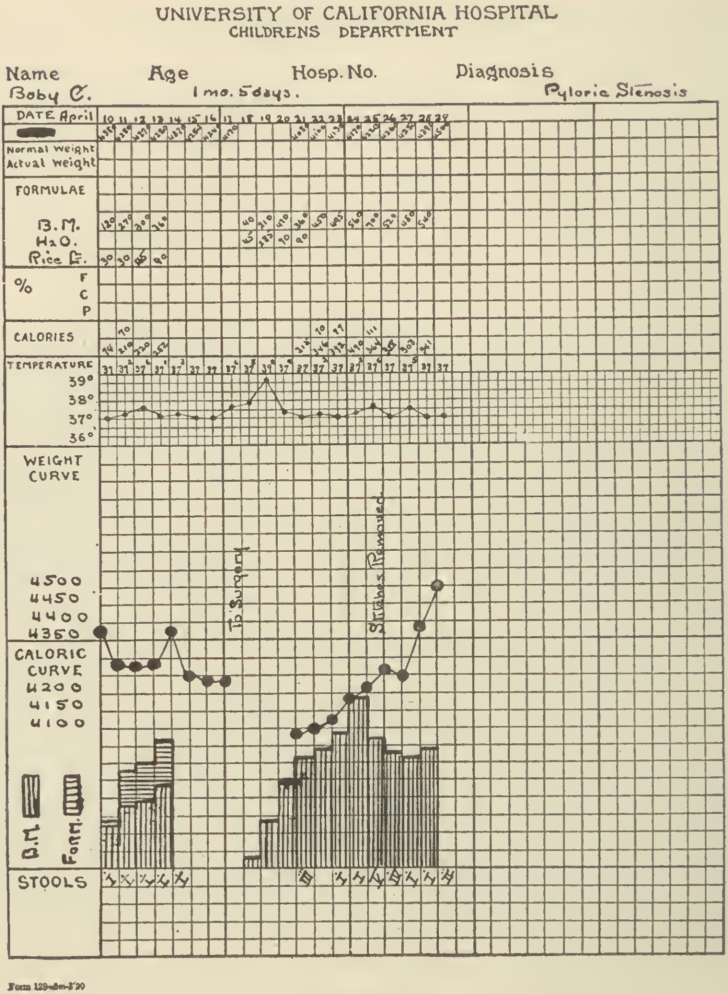

CHART 4.
Legend for
Baby C. (Hospital No. 10410)

Age: One month, 5 days.
Diagnosis: Pyloric Stenosis.

Baby C. was a full-term baby whose birth weight was nine pounds. He was breast fed every three hours. At the end of the first month, his weight was 9 pounds and 8 ounces. At the age of one month he began vomiting. The vomiting from the start was projectile in type. His stools diminished in quantity, and the baby lost slightly in weight, but was in good condition when he entered the hospital, at the age of five weeks. His physical examination showed a well-nourished and developed baby

INFANT'S FEEDING CHART

UNIVERSITY OF CALIFORNIA HOSPITAL
CHILDREN'S DEPARTMENT

Name Baby C. Age 1mo. 5 days Number

Date April	Feedings	Total 24 hr. Quan.	Cal. 100 c.c.	Total Cal.	Wt.	Gain or Loss	Dejecta	No.	Treatment and Notes
10	Breast Milk ē Rice Gruel	120	70	74	4380		Med. yellow pasty stringy	I	
11		270		210	4280	100−	Soft brown sm.	I	Regurg. all of 2 P.M. feeding.
12		300		220	4270	10−	" "	I	Regurg. 40/6 A.M. feeding " " H_2O or 2 P.M.
13		360		252	4280	10+	Hard sm. brown	I	" " entire 6 P.M. feeding " " 20/ at noon
14					4370	90+	Hard sm. yellow	I	" " 1 P.M. 6 P.M. " " 20/ 1 P.M.
15					4250	120−			Gastric lavage To Surgery
16					4240	10−			
17					4170	70−			
18	H_2O Breast Milk	45 40							Regurg. 5cc. 11 P.M. Not weighed.
19	H_2O Breast Milk	285 210							210 cc. N.S.S. per proctoclysis.
20	H_2O Breast Milk	70 470							
21	H_2O Breast Milk	90 390			4070	100−		III	
22	" "	450	70		4100	30+	Soft yellow	I	77 Cal. per Kilo.
23	" "	495			4130	30+			
24	" "	560			4170	40+	Lq. soft yellow	I	
25	" "	700	70		4220	50+	Sm. yellow curdy	V	Regurg. sm. amts. Stitches removed.
26	" "	520			4260	40+	Lq. dark greenish	IV	111 Cal. per Kilo.
27	" "	480			4250	10−	" "	I	
28	" "	540			4390	140+	" "	I	Weighed ē different dressing
29	" "				4500	110+	Soft yellow	II	

5m-8,'14

with an entirely negative physical examination except for peristaltic waves in the region of the stomach following the taking of any fluid. On account of his good condition, he was put on thick feedings, in this case, rice flour 16 per cent with breast milk (B. M.). The baby was kept on this for one week, during which time the child lost about one-half pound. He did not vomit as much and his stool showed that some food was passing through the pylorus However, on account of his continued loss of weight, he was operated on eight days after admission. The operation showed a very thickened cartilaginous ring at the pylorus. A Ramstedt-Frede operation was performed. The temperature and weight chart and the infant feeding chart shows the progress of the case both before and after operation. There was a slight rise in temperature following the operation and quite a marked loss in weight, but on discharge, fourteen days after the operation, he had passed his entrance weight by a quarter of a pound.

volvulus, of course, causes vomiting. Inflammatory conditions in the abdomen such as appendicitis and peritonitis lead to functional or organic obstruction and vomiting.

The treatment of vomiting. This is naturally related directly to the cause. If excessive food is the cause, lengthen the feeding intervals and lessen the amount of the feeding. If gas or swallowed air is at fault, handle the baby as described. If excessive food constituents are to blame, adjust them. Most infants respond to intelligent treatment. When it is not a question of food or of any known indigestion, the infant should be immediately re-fed. Often the vomiting will not occur again and the infant should not miss a feeding. In all these conditions feeding by gavage may assist. If the infant is thriving, vomiting should be simply treated, and radical measures avoided as the infant has an unconscious knowledge of his own stomach capacity and he will make certain physiological adjustments of his own!

The treatment of rumination is difficult. The mere mechanical measures such as thickening the milk with starch or cereals, preventing the hands from reaching the mouth as for thumb sucking, the strapping of the mouth so that he cannot open it or push his lower jaw forward, even the plugging of his nose with cotton are all measures which have succeeded and have failed. A study of the infant as a whole, an understanding of his physical state and how to divert the infant's attention after his feeding will often succeed where everything else has been of no avail.

The treatment of cyclic vomiting and the vomiting accompanying pyloric stenosis are discussed elsewhere as we are limiting our present discussion of vomiting to the simpler nutritional problems. Such types demand radical treatment.

Constipation and food are even more intimately related as the eliminating of body wastes depends largely upon the body fuel provided in the food given. We usually think of constipation as a resulting condition of wrong feeding but prolonged constipation may also become a causative condition, leading to other conditions.

Constipation results, therefore, when there is an insufficient stimulus to peristalsis caused by various factors or when the intestines do not respond to the normal stimulus. Constipation may be due also to particular conditions. Anemia may cause it; a high temperature often causes it. Congenital dilation of the colon (Hirshsprung's disease), any mechanical obstruction, or restriction of the intestines will cause constipation. Infants vary a great deal in the degree of irritability of the intestinal tract.

Certain types of food will constipate one infant and not another. Constipation is a common and troublesome condition in many otherwise normal babies.

As the causes of constipation are so varied it might be well to consider them in groups (1) Causes due to diet (2) Psychical causes (3) Physical causes.

Causes due to diet. Constipation is caused quite as often by underfeeding from either the breast of bottle as by overfeeding of different food factors. An underfeeding of the necessary fluids in water and fruit juices. The underfed infant will pass small, hard, dry stools either infrequently or again they may have three or four movements daily of dark green stools. When there is too high a proportion of fat in the food, the large amount of soap formed will lead to constipated dry stools. On the other hand if the food contains too little fat, after normal absorption has taken place there is not enough fat left to stimulate the colon. Too much starch or too much protein will slow down the intestinal peristalsis. The light colored putty-like stools of alkaline reaction, characteristic of infants fed on cow's milk dilutions, are caused by the relatively large amounts of calcium caseinate in cow's milk resulting from the large proportion of calcium and magnesium salts. This tends to delay the emptying of the intestine, colic may result and the food be too long in its absorption.

This retention of food in the intestine is, as we have seen, often the effect of overfeeding. The constipated infant often fails to gain in weight but the attempt to correct this by overfeeding only leads to an intestinal tract irritated to the point of bacterial decomposition which usually means diarrhea with further loss of weight. It is better to attempt to adjust the character of the food than to increase amounts. Often it is more sugar that is needed to increase the acid reaction of the intestine and thus check the excessive formation of soaps in the stools. Constipated infants often have urine with the strong odor of ammonia which is so irritating at times to the buttocks that an eczematous condition or blisters results. (Fig. 46.)

The entire treatment of these types of constipation mean patience and care in adjusting the food sufficiently to affect the sluggish conditions of the intestinal tract. We have spoken of increasing the carbohydrate intake by sugar addition, the value of fruit and vegetable juices, barley or oatmeal water. What is known as "malt soup" is a much used corrective and has certain advantages. It is made up of malt extract and flour in a one-third whole milk dilution and a usual formula is as follows: Dissolve 1½ to 2 tbs. of malt soup extract in a ½ cup of hot

water and measure in enough cold water to cool the mixture. With the remaining cold water (½ cup) mix 1 level tablespoonful wheat flour sifted, until it is free from lumps. Add one pint of milk to the malt soup mixture and then pour both mixtures into a clean sauce pan and bring to the boiling point slowly,

FIG. 46.—Intertrigo—excoriation of buttocks and scrotum.

stirring constantly. Simmer (not boil) for 20 minutes, then increase the heat and allow the mixture to boil for 5 minutes. Strain before using. If only one or two bottles of the malt soup formula are desired the amount of the ingredients may be cut down accordingly.

Because many infants are easily affected by malt soup often a half bottle will correct the constipation. Malt soup is a highly

fermentable sugar and one must be on guard in using it lest we exchange a condition of constipation for a diarrhea. The high acidity of the malt extract should be neutralized by the addition of 1 gm. of potassium carbonate to 3 ounces of the extract. This malt soup is not wise to feed to babies under three months of age or to any age infant during hot weather. The amounts and intervals of feedings follow normal schedules.

It is impossible to overestimate the importance of avoiding the use of drugs and mechanical agencies in treating these dietetic constipations. Such purgatives as calomel and castor oil should seldom be used. Milk of magnesia or mineral oil are the simplest

FIG. 47.—Rectal irrigation.

laxatives and infants seldom become dependent upon them. Hard soap stools may be expelled by using a glycerine suppository, soap stick, an oiled paper cone or low cleansing enemas. (Fig. 47.) (See Harmer, page 109.)

Psychical causes of constipation involve all the general hygienic care of the baby and the formation of proper habits. The daily bowel movement should be the natural result of the effect of careful routine on the child's mind. Threatening will not cause a bowel movement but the expectation of the performance regularly often assists. The normal action of the bowels is an act the young infant must do for himself, he must expect it of himself.

Physical causes of constipation include all the anomalies of

the gastro-intestinal tract with extensive involvements discussed later.

Diarrhea accompanies many conditions and may be evidenced by abnormally frequent bowel movements or the abnormality may lie in the character of the stools rather than the frequency. Like vomiting, it may be the result of irritating substances in the food or of drugs, or it may be caused by general diseases. Sudden chills or nervous fright may induce it. Hot weather plus excess clothing often causes it. When the intestinal mucosa is functionally weak in action, too little water may be absorbed, or too much sugar in the food will prevent absorption and tend to produce diarrhea. Perhaps the most common cause is fermentation caused by acid forming bacteria. Such diarrheas are not the result of an infectious condition of the intestinal tract but are true irritative conditions or the result of deranged physiological processes. We have many terms rather loosely used to designate this common type of diarrhea where decomposition of food is at fault. "Dyspepsia," "summer complaint," "cholera infantum," "fermentative diarrhea" and so forth. For descriptive purposes the term "acute intestinal indigestion" is as accurate as any. The indigestion is not always caused by factors that may cause it. Some infants possess intestinal tracts with strong digestive powers and contaminated milk may "get by" without causing diarrhea. Even definitely sour milk has failed to produce the condition and again milk that was sweet to taste has caused severe attacks of diarrhea. Often impure milk will cause an immediate reaction and again the effect will be delayed some time. There are many surprises in the whole study of acute intestinal indigestions as so many factors enter into the problem that one cannot be dogmatic. Infants have passed undigested vegetable matter such as vegetable seeds, or small chunks of apple without any trouble while at other times such mechanical irritations of the intestinal tract will cause acute diarrhea. Clean pasteurized and sterilized milk naturally offers fewer hazards for the infant which is the reason why the best of raw milk is not considered "safe" for infants and young children, although there is always the *one* instance where an infant has not suffered from raw milk, and accidental swallowing of improper food has not resulted in diarrhea but has been digested and absorbed without trouble. Again diarrhea may occur when there is no failure in digestion or when the stools fail to show any undigested food. One thing is certain and that is the difference between bacteria in their decomposing powers, and yet even here we do not know definitely just what micro-organisms are responsible for the

formation of substances that will produce diarrhea. There are undoubtedly large numbers of bacteria that are capable of setting up increased peristalsis.

The group of **infectious diarrhea** are quite apart from these acute intestinal indigestions. Here the intestinal tract itself is actually diseased by the organisms causing the illness and the irritative conditions we have discussed may or may not be present.

While bacterial decomposition of food causes the most usual type of acute intestinal indigestion, diarrheas occur as the result of improper proportions of food constituents such as the laxative effects of too strong sugar proportions or too high concentrated solutions of mineral salts, or too much fat. Severe infections such as scarlet fever, measles, pneumonia, otitis media, septicaemia, pyelitis, uremia often induce diarrhea because of the lowered functional capacity of the whole body including the intestinal tract.

Fever will affect digestion and absorption just as quickly as any external overheating of the body due to weather or excessive clothing.

Diarrhea even of this simple type does not drop from the skies but the stage is set upon which the condition develops most easily. If the upper intestinal tract is irritable and susceptible, the introduction of bacteria-producing substances find a good medium upon which to thrive. Any condition internal or external that leads to a lessening of the normal protective secretions in the tract will favor the development of diarrhea. To prevent and check successfully this simple type of diarrhea is, of course, of great importance.

Stools in acute intestinal indigestion differ widely as to the number and character owing to wide variations among infants in their normal intestinal conditions. Some infants will pass as many as 15 stools daily while others will have much fewer. If the food passes through the intestine quickly and the absorption is poor, the stools will be soft and watery and green in color because the bile pigment in the upper intestinal tract is green and when the action of the intestine is rapid, this bile pigment passes through unaltered and gives the typical green diarrheal stool, varying in shade but consistently green. These stools are usually *frothy* in appearance and acid in reaction because of the presence of organic acids and much gas during these attacks. If prolonged, the stools become mixed with mucus, often resembling small curd-like balls.

High or continued fever is the exception in these diarrheas

and should never be complacently accepted for long. Slight *initial fever* is common, however.

The urine is perhaps slightly less in amounts but otherwise normal unless the condition becomes severe and stubbornly persistent. Most infants show by their actions the presence of colicky pain due to the gas and will lie with legs drawn up as though griped with pain which will be relieved when the gas is passed. Sleep is poor and fretting constant.

Mild attacks of diarrhea can be thrown off readily by most normal infants if the condition and the causes are quickly recognized and proper treatment given. Under such conditions the weight loss may be slight but if the condition persists even in a mild form for weeks, starvation is a very real danger and the chances for infection are high. When an infant much below par nutritionally has a severe attack of diarrhea passing large watery stools constantly, death may come quickly. The young infant especially cannot stand such rapid water losses because his water reserves are not large. *Water loss* caused by weeks of even a mild type of diarrhea will lead to a drying out of the body that will end fatally. The more serious conditions of this dehydration will be discussed under *Anhydremia*. Under *Athrepsia* we will discuss in detail the condition of malnutrition which ends in starvation as a result of the failure of the intestinal tract to meet by digestion and absorption the basal food requirements. When diarrhea persists, the food loss is great and the food intake is always reduced in the effort to adjust the condition. Therefore, these two serious consequences, *water loss* and *starvation,* of even the most simple type of diarrhea must be appreciated and guarded against from the very beginning and water intake constantly increased to offset the loss and every detail of the care of such cases worked out with reference to the infant's reserves of food and water.

The **treatment** of these acute intestinal indigestions is almost entirely environmental. The right amount of food, the proper clothes, the proper sleep, the proper hygienic habits are just as fundamental as the boiling of the milk used for the food, and the study and adjustment to the particular infant to be fed of the various food factors. Smaller amounts of food should be given during spells of hot weather, and more water given. No diarrheal condition, however slight, should be considered as unimportant. Just a little diarrhea can, if neglected, light a devastating fire. Severe diarrheas *can be prevented.* At the same time, alarmist methods are to be avoided. At the first slightly loose stool or increase in stools, it is not wise to immediately change

the food, but far better to perfect all the other environmental conditions, and if the infant shows no other symptoms and progresses normally, watch him closely and give him a chance to make his own adjustment. But if external conditions are bad, excessively hot weather and the baby rather worn and fretted, simple measures should be instituted at once. Let the breast-fed baby nurse a shorter period and make up his fluid intake with sterile water. The same thing for the bottle-fed baby with perhaps the omission of sugar from one or two bottles will check the condition. The omission of a single feeding entirely may give the infant's intestinal tract time to make the adjustment.

But when the condition is plainly severe, complete withdrawal of food becomes necessary in order to give the upper intestinal tract opportunity to free itself of bacteria. To continue to *add* food to food already unabsorbed and fermenting is only making a bad situation worse. When a period of starvation is therefore necessary, it is not necessary to do more than withhold food. Using cathartics is only an additional strain on the intestinal tract and should not be resorted to unless in an emergency when some acutely irritating substance has been swallowed. Castor oil is then the best laxative.

The withdrawal of all food is a radical measure and it is always difficult to determine just how long the starvation period should be. When the condition is quickly affected by the withdrawal of food a 12-hour starvation period usually checks the diarrhea, but when symptoms persist it may be necessary to withhold food for as long as 24 hours. In any case the starvation period is handled with less strain for nurse and mother and child if plenty of water is given, even weak tea or barley water may be used to lessen the hunger and check the insistent crying. Just as much water as the infant can take and keep down should be given. Sweetening the water a bit with a saccharine tablet will often assist in getting the baby to take the water. One must always remember that the objective is to pull the infant back to normal as quickly as possible, not just to stop the diarrhea and this is the biggest factor in determining the length of the starvation period. To continue starvation until the destructive process of dehydration begins may lead quickly to a fatal end. Too little food is just as dangerous as too much food; the water intake is as important as the food intake. The nursing care of such cases calls for the most meticulous observation, the condition will change with lightning-like rapidity and irreparable damage may be done in a very short space of time. If the infant is breast fed, these simple diarrheas are usually of short duration and if the breast is

denied for several feedings, the milk should be manually expressed in order to keep up the milk supply, until the breast is again offered the infant. If the mother can safely leave the care of the baby to the nurse during the starvation period, the infant will be more amenable.

The stools usually reflect the starvation period immediately, they will become less in number and smaller in amount and the mucus will only remain as faint streaks in the stools and the stools themselves become mere dark green stains. This is a satisfactory result and a usual result of starvation but there are other less favorable results. There are times when even a 24-hour starvation period will fail to make the stools less watery, showing that the intestinal irritation is still acute. At such times it is best to give careful doses of paregoric to stop the peristalsis and thus give the intestinal tract the further chance to conquer the disturbance. The idea that this form of opium used with care is worse than the diarrhea in its effects is quite erroneous. When paregoric becomes necessary there are no further poisons in the intestinal tract and the continued action of the peristalsis has become almost a mechanical act of sheer weakness.

We cannot, usually, in these severe cases wait until the stools are normal before we begin to feed the infant as the starvation is no preparation for normal digestion but purely a check upon the abnormal condition, and therefore, food must be given just as soon as possible or the last predicament will be worse than the first. This same idea is the reason for stressing constantly as we have the water intake which must be frequently and copiously given.

Often feeding may be begun earlier for the bottle-fed baby if breast milk can be given, but the return to feeding of either the bottle-fed or breast-fed baby must be gradually accomplished and always the individual baby must be the guide. Breast milk may be too high in sugar content to be tolerated by an infant whose acute indigestion began as the result of too high a sugar content in his food. In some cases it is better to give a little breast milk with a weak milk dilution. The objection of the feeding is to cause no return of the diarrhea and to keep up the caloric requirements thereby causing as little damage as possible to the nutrition and to the physiological capacity of the infant.

When very young or poorly nourished infants suffer from this type of diarrhea, the first feeding after the starvation period should be lactic acid breast milk if possible. Buttermilk is the best substitute for this and may be given with the breast milk at alternate feedings. But in any case the feedings should have as

their basis milk which has been soured by pure cultures of lactic acid producing organisms. The advantage of this is that such milk is not so apt to grow other fermentative organisms, the lactic acid content acting as an unfavorable medium. Great care must be exercised in using these lactic acid preparations as milk soured at too high a temperature and for too long a period can be too acid for safe use and only add to the intestinal irritation we are attempting to correct. In the same way, it must be remembered that lactic acid production always means the lowering of the sugar content and we must estimate that content in lactic acid milk as 0.5 per cent less than in ordinary cow's milk and allow for this in the milk mixture.

Protein milk is a form of lactic acid milk which gives even better results in these conditions than either breast milk or buttermilk. Protein milk is a buttermilk which has had its protein constituent increased by the addition of the casein from an equal amount of milk. This makes a milk of much higher caloric value and the excess of protein content over the sugar content results in a medium unfavorable for the growth of the fermentative bacteria. As this is also the effect of the lactic acid content the combination of buttermilk and casein give increased protection from the growth of harmful organisms. The methods of preparing protein milk varies somewhat thereby causing variations in the composition of such milk but the generally accepted proportions of food factors are Fat 2.5 per cent, Sugar 1.5 per cent, Protein 3.5 per cent, this makes a food value of 12 calories to an ounce.

Method of Preparation of Protein Milk.

1 quart fresh whole milk
1 pint fresh buttermilk
4 tsp. essence of pepsin

Heat the whole milk to 100° F., add essence of pepsin and stir thoroughly. Allow to stand at the same temperature until the curd is formed. Pour the mass into a muslin or cheese cloth bag and drip the whey from the curd. When the mass is as dry as it is possible to have it, remove it from the bag, wash twice in cool running water and then transfer to a fine strainer. Press the curd through the strainer with a wooden spoon or potato masher. The mass must be passed several times through the strainer in order to make the preparation sufficiently fine to look like milk. During the process of straining, the buttermilk is added. Protein milk does not necessarily have to be prepared at home as there are several firms in the country such as Louis Hoos, Chicago,

Soule Merrill & Co., and others who put up a dried form of protein milk which is ready for use by adding water to it. Larosan powders can be used and these can be added to a skimmed milk formula of any desired strength.

These dried forms keep well and are convenient to use. Some cities have milk laboratories like the Walker-Gordon Company Laboratories or the Hospital Dietitian Milk Laboratory that will supply protein milk from prescription orders. When protein milk is used in these diarrheal conditions the same caution must be used in the amounts of the feedings. Protein milk may be used undiluted but only ½ the usual amount of food for the size and age of the baby should be given at first and the amount slowly increased as the intestinal irritation lessens. Owing to the absence of sugar, undiluted protein milk is not a successful diet for very young or undernourished infants for a very long period as the nutrition will suffer severely if sugar is absent from the food and therefore sugar must always be added to the mixture for these infants within a day or two and for all infants within three or four days. To exchange diarrhea for starvation with the resulting athreptic condition is jumping from the frying pan into the fire.

In adding sugar the Dextri-Maltose preparations and corn syrup are forms of sugar well tolerated because they contain relatively large per cents of non-fermentable dextrin. But sugar must follow the same principle of gradual addition of progressive amounts. Beginning with 2.5 to 3 per cent of sugar, the amount should not be raised to 5 per cent until the diarrhea has ceased and the stools are soapy in character. At this stage the amount of protein milk feeding should be guided by the normal amount of the usual food he would be receiving at his weight and age. When protein milk is used the return to the usual milk formula must be made gradually also beginning by substituting a feeding of the suitable ordinary milk formula for a protein feeding and continuing this until the normal formula for the age is reached.

In this process of adjustment better results are obtained if the amount of sugar in the normal formula is kept a little under the minimum. Where infants seem to have a tendency to recurrent attacks of diarrhea, the use of the whole lactic acid milk instead of sweet milk in making up the normal formula for the age has proved to be of preventive value. In discussing athrepsia, more details of this special type of feeding will be given.

Many mild forms of diarrhea will respond to less radical treatment than outlined above. Often the condition will yield to the substitution of skimmed milk for whole milk in preparing the

formula and many times just the plain undiluted skimmed milk will clear away the irritation. In using skimmed milk one must not forget that it has only one-half the *caloric* value of whole milk and cannot satisfy the basal caloric needs. Many times the mild diarrheas are checked by just diluting the usual formula, giving a slightly weaker formula than usual by decreasing the amount of sugar and diluting the milk. A six months old infant might be starved for a feeding and then given 4 ounces of a ⅓ whole milk dilution without adding sugar, and if this is well tolerated the milk mixture may be increased to ½ whole milk dilution and a little sugar added. There should never be any jumps in the amount or strength of the formula but all increases, even in these mild diarrheas, made gradually and smoothly until the normal feeding for the age is again reached. Observation, keen and accurate, is the nursing background for these steps in treatment as any unfavorable symptom must be quickly recognized and one must return to an earlier stage and readjust the diet to meet the old symptom.

When the severe cases of gastro-intestinal indigestion develop toxic symptoms the treatment follows that which we will discuss in caring for anhydremia. When we have an infectious diarrhea or dysentery to treat, we must remember that we are here dealing with a diseased intestinal tract, and that changes in food cannot affect these definite lesions and therefore, more food can be given with a higher sugar content than in the diarrheas we have previously discussed and this is necessary in order to build up the nutrition of the child and his powers of resistance to fight the infection successfully. At the same time, the diet adjustments must be carefully made or one will add an acute intestinal indigestion to an already diseased intestinal tract.

In all these diarrheal conditions, mild or severe, one cannot fail to see how quickly the infant will respond to improved hygienic care. Some babies if they can be kept in a quiet, well-aired room quietly resting and only the necessary handling permitted, can throw off the attack of diarrhea without resorting to changes in the food. Many babies will develop diarrhea from as mild an excitement as a christening party seems to an adult!

Of these three conditions, vomiting, constipation and diarrhea, diarrhea is the condition most dreaded by the nurse because of the devastating effect of a severe attack upon the whole condition of the baby. To pull a baby through such attacks and put him on the road to catching up on what he has lost, taxes all the skill and patience we possess, and in no situation is team work, accurate and constant observation, skill in handling, patience in

working for the desired results, more necessary or more rewarding than in those diarrheal conditions. When we have successfully prevented a slight attack from being a severe attack, the baby has been spared from many other hazards of varying degrees of severity.

DISCUSSION OF VARIOUS TYPES OF STOOLS

Cow's milk stools are firmer than those of breast milk and are passed less frequently, usually only two or three daily. There is a slight tendency to constipation on cow's milk. The stools are rather lighter in color because of the increased amount of protein in cow's milk. For this reason they are also slightly alkaline or neutral in reaction. They have a slight cheesy odor, slightly fecal and disagreeable. This odor depends upon the amount of protein the baby is getting and as has been stated the amount of protein in turn will favor the growth of proteolytic flora in the intestinal tract.

Skimmed Milk Stools. The baby who is getting skimmed milk has entirely different stools. They are more solid and salve-like, have a brownish yellow color, are decidedly more fecal in odor and sometimes they are distinctly foul. They also have a stronger alkaline reaction.

Whey Stools. The baby who is fed on whey has more frequent stools, even more liquid at times than the normal breast-fed stool. They are greenish in color but may be brownish.

Starch Stools. When starch is added to the diet, or when malt sugar is added, the stools become browner, have an acrid odor and if there is sufficient fermentation, the reaction will be acid. They are often a grayish brown color.

Protein Milk or Buttermilk Stools are salve-like in consistency, alkaline in reaction and have a penetrating acrid odor due to lactic acid, though at times they may be quite fecal.

Beef Juice Stools. When beef juice is added to the baby's diet the stools become darker in color and have a very distinct fecal odor and a strong alkaline reaction.

Starvation Stools. The typical starvation stool, as already stated, resembles that of meconium, consisting largely of intestinal detritus, mucus, bile salts and bacteria. They are greenish in color and may be distinctly offensive.

Curds. Stools may contain curds which may be made up mostly of soaps, or of proteins, or of mucus. The soap curds are the most frequent. They are small, soft and easily mashed with a spatula. They occur normally in the stools of breast-fed infants, but are also seen in diarrheal stools. The presence of

such curds indicates that peristalsis has been rapid and that there has not been sufficient time for the absorption of water and the compression of the curds into firm masses. The occurrence of soap curds, however, does not necessarily indicate that too much fat is being fed, as they will occur in stools no matter what the cause of the diarrhea. The large, tough, bean-like protein curds are only seen in the stools of infants fed on raw cow's milk. They are hard and tough, usually have a yellowish color, and are about the size and shape of a small lima bean. They are formed in the stomach. Fat curds will be dissolved by ether and will float on water, whereas protein curds will not be dissolved by ether and will sink in water. An excess of mucus in the stools may cause the appearance of small stringy curds due to the drying of the mucus, and usually there is some fat, soaps or protein enmeshed in the mucus.

Any normal stool may become green on standing. This is due to dehydration and oxidation of the bilirubin and to hydrobilirubin or to biliverdin. This often occurs in normal breast-fed stools, or in loose milk-fed stools, which are yellow on passing but soon turn green. This does not usually indicate a pathological condition.

Drugs Affecting Stools. Certain drugs which are given to the infant may cause definite changes in color. Bismuth causes a darkish brown discoloration. Argyrol when used gives a black color to the stool, which may be mistaken for changed blood.

White Constipated Stools. When a large excess of fat is given the stools may contain so much soap that they become white or greyish. Often these stools are very hard and putty-like, and may at times resemble the typical dry-formed dog stools.

Abnormal Stools. When the child is suffering from malnutrition or from an infectious intestinal condition, blood may be present in the stools, or even pus and mucus in large quantities are usually present under these conditions. They are practically always greenish and foul. Where fermentative conditions exist the stools are large, contain mainly mucus and a small amount of fecal material. They usually have no blood nor pus, so that the differentiation between an infectious diarrhea and a fermentative diarrhea can be easily made.

Undigested Masses in the Stools. When an infant is on a mixed diet, especially on vegetables, there is some evidence of them in the stools. Spinach and carrots and other vegetables can easily be distinguished in the infant's stool. This does not mean that they are not digested, but the cellulose which is

undigestible and not absorbable retains the original color of the vegetable and appears in the stools.

Blood on the Outside of Stools. At times when infants are constipated there will be a streak of blood down on one side of the stool mixed with a little mucus. This usually does not indicate anything serious. It simply means that some rough part of the stool has abraded the mucus membrane in its procedure through the rectum. If, however, the blood persists, it may mean a fissure at the anus, which should receive attention. If there is a prolapse of the rectum, there will usually be more or less blood and some mucus.

The color of the stools is influenced by the rate at which the food passes through the intestinal tract. The diarrheal stool is generally green, a soft stool yellowish, and a firm stool light brown or almost white. These colorations are due to the fact that the bile in the upper intestine is green, but after it has remained for some time in the intestinal tract, chemical action occurs which changes the green to yellow, later the yellow also becomes changed to a colorless fluid. When diarrhea occurs the green bile color passes through the intestines so rapidly that it is not changed. A yellow stool, as I have already said, if exposed to the air for some time, often turns green due to a process of oxidation. This change of color is of no significance. A slight amount of glistening mucus may be seen in the stool of the breast-fed infant. A large amount of mucus in the stools of either breast or artificially fed babies is an indication of irritation of the intestinal tract and is commonly seen when diarrhea is present.

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CHAPTER X

MALNUTRITION OR ATHREPSIA-ANHYDREMIA

We have spoken of the difficulty of differentiating between acute and chronic conditions in the intestinal disturbances of the bottle-fed baby. The end results of the acute diarrheas which persist over long periods may be the condition of malnutrition. Whatever the chronic condition, we know that we are faced with a problem that will take endless patience and skill to correct. The slow insidious exhausting effect of chronic conditions is one of the gravest dangers, the exhaustion that is taking place may not always *show* in tangible or surface symptoms or conditions but may lie deeply within the body tissues and the outward manifestation of the inner destructive processes may not be at all commensurate with the amount of actual damage being done.

Malnutrition. Malnutrition is essentially a condition of starvation and may be of all grades irrespective of the cause. It is primarily due to the qualitative or quantitative defects in the feeding. (Chart 5.) Many infants who have been fed on proprietary foods such as sweetened condensed milk may develop marked conditions of athrepsia (absence of nutrition) because the dilutions ordinarily given contain insufficient quantities of fat and protein and vitamines, and may or may not contain too high percentages of sugar. Occasionally we meet an infant who has been kept on dry breasts too long and has developed malnutrition from true quantitative starvation. There are still other infants who even when fed on fairly good milk mixtures slowly become athreptic after manifesting the milder symptoms of indigestion. These are the constitutionally weak infants or the condition of malnutrition may develop in connection with parenteral infections. At times these infections appear to be the result of the condition rather than the cause although just as often the reverse may be true. We know that during an infection the infant has less reserve energy which results in the stagnation of food followed by bacterial invasion. Sometimes the infections are overlooked and these infants are considered as constitutionally weak infants. The infections are at times multiple such as pyelitis accompanied by upper respiratory tract infections and otitis media. What part the lack of vitamines and salts play in

the production of these insidious chronic conditions is hard to say. Where the defects in either vitamines or salts are marked the symptoms are fairly characteristic but where the deficiency in these substances is not so marked the results may be the development of chronic malnutrition.

Many theories relating to the causation of chronic malnutrition have been developed. All the constituents of cow's milk have in turn been held responsible. At first the proteins of cow's milk were supposed to be undigestible but unless proteins are fed in very excessive amounts they do not cause any disturbance, in fact high percentages of protein are fed successfully in treating the diarrhea which so often brings about these chronic conditions. The fat in cow's milk has also been blamed but unless fat is fed in an excessive amount, i.e., more than is found in whole milk 3 to 4 per cent, it will not cause any disturbance in the normal infant, indeed in the usual dilutions the amount of fat is considerably less. However, there can be little doubt that, after an infant has been upset or during and after an infection, the digestive capacity for fat is lowered. We also know that during such a period, the length of time food remains in the stomach is prolonged, digestion is slowed down and the normal processes are deranged.

In the same way the salts of cows' milk have been thought to so affect the digestive ability of the infant that these chronic conditions are brought on. There can be no question that, when the milk is not properly diluted or prepared, many infants will show definite signs of the lack of mineral absorption—the salts become insoluble—i.e., calcium and magnesium soap stools—or are lost in large part if the infant has suffered from diarrhea. A good deal of the trouble with cows' milk is, however, not to be found in any of these differences, but, as Marriott of St. Louis has pointed out, in what is known as the higher buffer value of cows' milk as compared with human milk. That is, cows' milk needs 3½ times more acid to bring the gastric acidity up to the optimum for gastric digestion. The stomach must secrete this extra acid (HCl), and this draws out of the infant salts needed for building up bone and tissue. This extra call for gastric juice slows down stomach digestion and when the stomach contents reach the duodenum, here again the same high buffer value of cows' milk makes it necessary for an extra amount of the alkali salts of the intestinal secretions to be poured out before the optimum reaction for digestion at this point is reached. This consequently slows down intestinal digestion, there is lessened

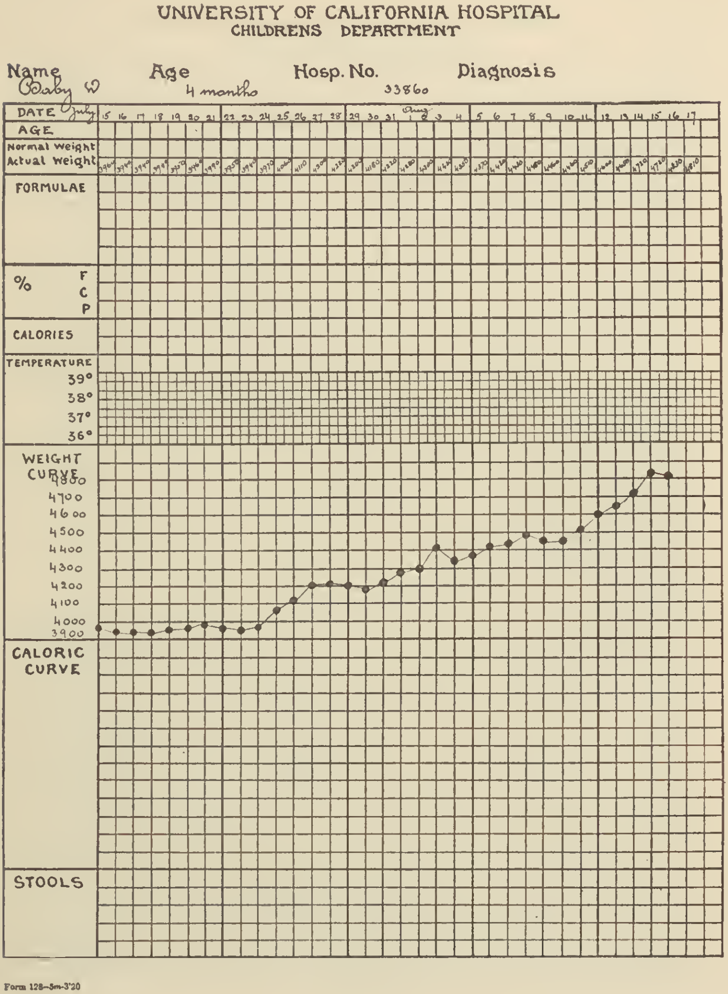

CHART 5.

Legend for

Baby W. (Hospital No. 11487)

Diagnosis: Athrepsia—moderate malnutrition.

These charts show the following important points: The temperature chart shows during the early days a sub-normal temperature which is so characteristic of these athreptic infants. During the first ten days there was very little gain in weight, following which the weight curve shows a steady rise in weight. The nurse's record sheet and feeding chart show the type of feeding in amount and caloric value of the food given.

INFANT'S FEEDING CHART

UNIVERSITY OF CALIFORNIA HOSPITAL
CHILDREN'S DEPARTMENT

Name Baby W. Age 4 Mos. Number 33860

Date	Feedings	Total 24 hr. Quan.	Cal. 100 c.c.	Total Cal.	Wt.	Gain or Loss	Dejecta	No.	Treatment and Notes
July 15	Wh. Milk 450 H_2O 450 C.S. 45/ 6x150		55		3960				79 Cal. per Kilo.
16		900		495	3940	20 −	Yellow form'd med. amt.	I	
17	Wh. Milk 480 H_2O 480 C.S. 57	900	59	21 495	3950	10 +	Soft form'd yellow Soft clay col.	III	144 Cal. per Kilo.
18		920		519	3940	10 −	Med. amt. & curds Yellow. form'd Hard sm. amt.	II	
19		960		566	3950	10 +	Med. amt. yellow. creamy Soft yellow	II	
20	Wh. Milk 610 H_2O 410 C.S. 51	1000	62	620	3960	10 +	Soft yellow	I	160 Cal. per Kilo.
21	170x6	1000		620	3990	30 +	Hard. yellow med. amt.	I	
22		1020		632	3950	40 −	Med. amt. soft yellow smooth	II	
23	Wh. Milk 600 H_2O 600 C.S. 60	1020	66	673	3940	10 −	Soft yellow med. amt. sm. amt.	III	201 Cal. per Kilo.
24	3% Protein 200x6	1200		792	3970	30 +	Soft yellow med. amt.	III	
25	3% Protein 200x6	1200		792	4060	90 +	Soft yellow med. amt.	III	
26		1170		772	4110	50 +	Soft yellow med. amt.	III	
27	Wh. Lactic 450 H_2O 480 Kero 70 6x160	1090	64	713	4200	90 +	Soft yellow med. amt.	I	148 Cal. per Kilo.
28		960		614	4220	20 +	Soft yellow med. amt.	II	
29		960	69	614	4200	20 −	Soft yellow med. amt.	I	
30	Wh. Lactic 600 H_2O 410 Kero 70 6x170	960	69	655	4180	20 −	Soft yellow med. amt.	II	170 Cal. per Kilo.
31		1020		703	4220	40 +	Soft yellow Hard " " med. amt.	II	
Aug. 1		1020		703	4280	60 +	Yellow form'd med. amt.	I	
2		1020		703	4300	20 +	Soft yellow med. amt.	III	
3		1020		703	4420	120 +	Soft yellow Hard " " med. amt.	III	
4		960		662	4350	70 −	Soft yellow med. amt.	III	Refused 60/ of 2 P.M. feedg.
5	Wh. Milk 600 H_2O 410 Kero 70 6x170	1020	68	703	4370	20 +	Soft yellow med. amt.	III	160 Cal. per Kilo.
6		1020		697	4420	50 +	Soft yellow med. amt.	II	
7		1020		697	4430	10 +	Soft yellow lg. amt.	I	
8		1020		697	4480	50 +	Soft yellow	I	

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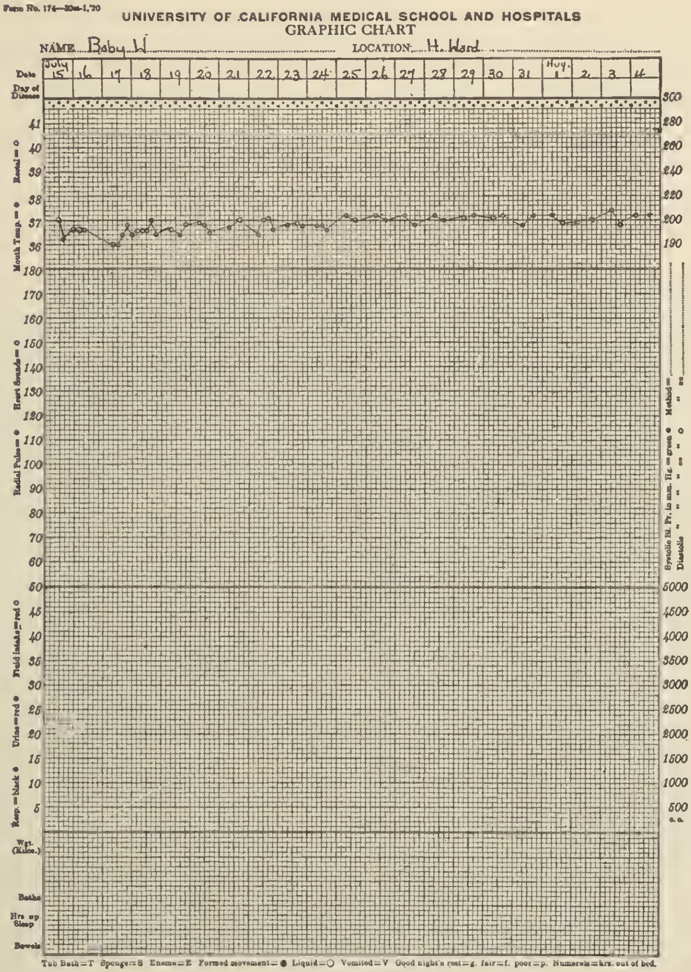

Form No. 174—30m-1,'20
UNIVERSITY OF CALIFORNIA MEDICAL SCHOOL AND HOSPITALS
GRAPHIC CHART
NAME Baby W.
LOCATION H. Ward
Date
July 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 Aug. 1 2 3 4
Day of Disease
Rectal = ○
Mouth Temp. = ●
Heart Sounds = ○
Radial Pulse = ●
Fluid intake = red ○
Urine = red ●
Resp. = black ●
Systolic Bl. Pr. in mm. Hg. = green ●
Diastolic
Method =
Wgt. (Kilos.)
Baths
Hrs up Sleep
Bowels
Tub Bath = T Sponge = S Enema = E Formed movement = ● Liquid = ○ Vomited = V Good night's rest = g. fair = f. poor = p. Numerals = hrs. out of bed.

stimulation for the bile and pancreatic secretions and the opportunity for bacterial activity is greatly increased.

This theory explains why, when the buffer value of cows' milk is reduced either by dilution or by acidification, i.e., lactic acid milk, cows' milk becomes digestible and infants are no longer troubled by the fats, proteins or salts of cows' milk. These modern conceptions of the digestibility of cows' milk represent the development of about thirty years and many unsettled problems

Fig. 48.—Characteristic position and emaciation of athreptic infant.

remain for careful laboratory and clinical investigation but we have at least learned how to prevent a great many of these chronic conditions and it is far easier to prevent than to cure a marked case of malnutrition or athrepsia (a lack of nutrition).

Whatever brings on the condition, whether repeated gastrointestinal disturbances or just a lack of a sufficient amount of milk, dry breasts or too weak a formula, the end result is the same, the assimilation of less than the infant requires. Such an infant must lose weight through the growth in length may continue at a lessened rate as that is a fundamental biological

process which even starvation cannot check. To keep up life processes in the presence of too little assimilated food means the use by the body of first, the stored up body carbohydrates, glycogen, then the fat depots are used up, and finally body protein is broken down. When this stage in our condition of malnutrition is reached we have arrived at the danger point, for the bodily capacity to assimilate or oxidize food products is lowered and gradually lost, the broken down products of metabolism

Fig. 49.—Normal infant and athreptic infant of same age.

begin to pile up in the blood and we are on the brink of a fatal outcome.

It is not difficult to distinguish these babies, they are wasted to little more than skin and bones (Fig. 48), their features are sharp, the fontanelles and sutures of the skull are easily seen or felt as depressed, the ribs can be readily seen and through the thin abdominal wall, the intestines can often be seen and the peristaltic waves can often be clearly distinguished (Fig. 49). The skin lies in folds especially in the groins, thighs and axilla, it may be easily picked up and shows the loss of tone and elas-

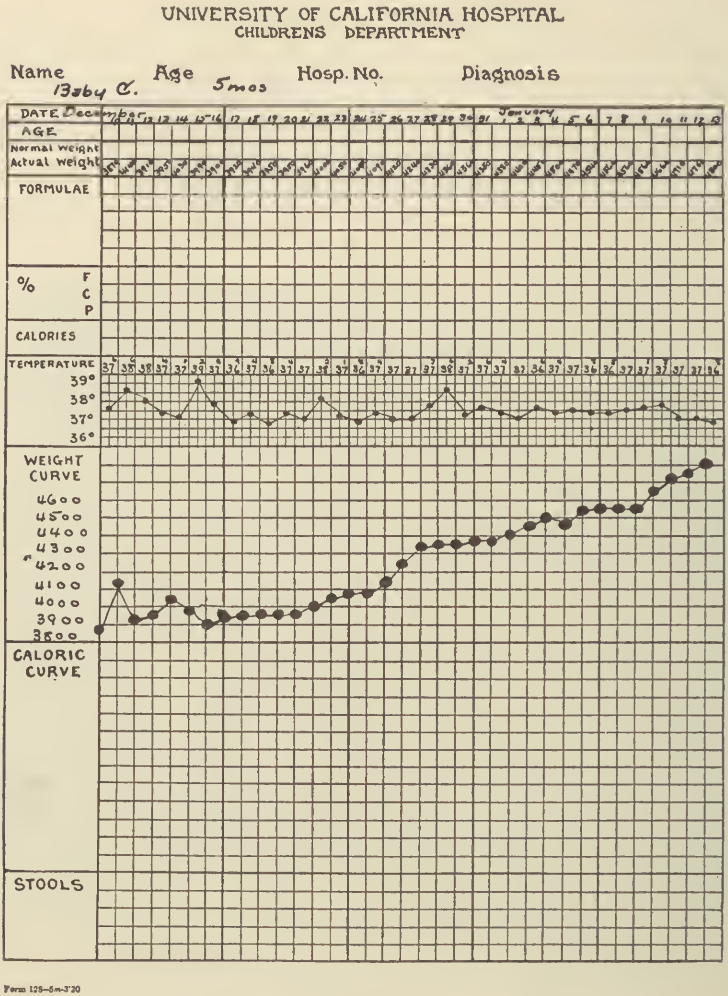
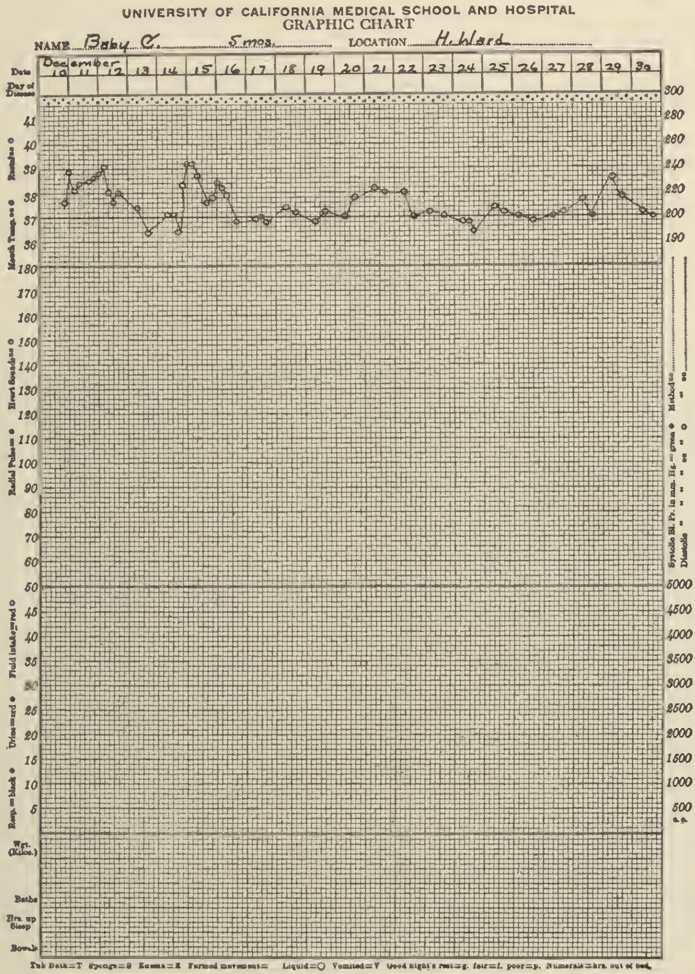


CHART 6.

Legend for
Baby C. (Hospital No. 9904)

Diagnosis: Athrepsia complicated by Otitis Media.
Age: Five months.

The family history in this case was negative. He was a full-term, normally delivered baby with a birth weight of 10¼ pounds. He was only breast-fed for the first week. He was then put on condensed milk. At first he did fairly well on this, but during the past month he had vomited after every feeding and became restless and irritable. His physical examination showed a markedly athreptic infant with moderate signs of dehydration and quite marked anemia. His tissues were rather dry and the folds of the skin had lost most of their elasticity. His hemoglobin was only 50 per cent of normal. As shown by the temperature chart on entrance, he had quite a marked temperature which fluctuated considerably. This was due to a double otitis media which was already discharg-



ing when he was admitted. During this period of temperature fluctuation his weight remained stationary, although fluids were forced in considerable quantities. After his ear condition improved and the temperature became normal, the weight curve showed definite gain. On account of his vomiting, the feedings at first were of low caloric value, being a two-fifths formula of 100 c.c. (3½ oz.), six feedings a day. During the first two weeks water was forced so that he received from 300 to 500 c.c. of water. His food was gradually increased in strength until finally, during the period his weight curve showed a gain, he was receiving 169 calories per kilo.

At that time his formula was made up of whole lactic acid milk, 600 c.c., 3 per cent barley water, 300 c.c. and Karo 45 grams. At the time of discharge, he was on a whole milk formula of 800 c.c. of whole boiled milk, 200 c.c. of water, 50 grams of Karo, and was receiving 165 c.c. (5½ oz.) at a feeding and six feedings. Besides this, he was receiving fruit juice, cod liver oil, and one feeding of cereal. This amounted to 130 calories per kilo during his stay in the hospital, which covered a period of two months. He gained from 3,870 grams (8½ lbs.) to 6,280 grams (13¾ lbs.). He left the hospital in good condition, and his follow-up record shows that he has continued to improve.

ticity by the slowness with which it smooths out to its normal position; the extremities are cold, the temperature is likely to be subnormal, the pulse is so small it is difficult to take and is often quite slow. The infant may be too weak to do more than whine when disturbed, lying quietly usually sucking his hand or fingers and looking intently and eagerly for food. He is always acutely hungry and is never satisfied. Many times the infant will empty a bottle only to vomit it all up and then begin again the constant sucking causing at times a hypertrophy of the cheek muscles ("sucking pads").

The stools reveal very little of the really serious condition, if these infants should have a diarrhea, the stools resemble very closely the stools of simple diarrhea, in fact are often not so alarming in appearance. At times the stools may appear fairly normal.

An estimate of the general condition of the infant is important, especially his loss in weight, his temperature, pulse, the reaction to food. This is called paradoxical reaction, i.e., the more food the more loss in weight is often significant although it does not always mean the infant cannot tolerate such food. It may mean the loss of water as in this abnormal nutritional state they are very apt to become edematous due to the accumulation of water in the tissues and just as suddenly lose this water, so that sudden large gains or losses are thus to be accounted for. Both are serious as they indicate an extreme state of malnutrition and disturbance of the water metabolism. Often with these sudden losses an infant passes into a state of collapse and dies in a few hours. The temperature drops to 95° F. or less, the child becomes cold, limp, lifeless, the end may come either in a state of coma or convulsions.

Anhydremia. A severe type of diarrhea is likely to occur in these athreptic infants in which the water lost by the bowels is very great. When this develops and it usually develops suddenly, an infant may lose one to four, or even more pounds in 24 to 48 hours (1 to 2 or 3 kilos). With the diarrhea vomiting of an intractible type often develops and the water loss is still further increased by a rapid rise in temperature even though the surface of the body may feel cool. Of course the high temperature causes an increased loss of water from the lungs.

The picture of such an anhydremic infant is a striking one (Fig. 52). The infant, already emaciated, seems to wither away, the color becomes cyanotic, pale like "wet ashes," the skin lies in deep wrinkles and loses its elasticity almost completely (Fig. 51), and feels dried up, the eyes are bright, expectant and

never still (Fig. 50). There is a constant motion of the head and body or the child may lie in a stupor with a dull vacant expression and rapid deep breathing so characteristic of acidosis. The pulse is small and hard to feel or count.

The condition is due to a dehydration of the tissues,—the skin, the muscles and the blood lose water rapidly, as a result the blood gets thick and will not flow, sometimes no blood comes when such an infant is stuck with a needle, there is very little blood in the peripheral circulation. Life is impossible under such conditions, all the vital centers,—respiratory, heat regulat-

FIG. 50.—Method of giving salt solution into the peritoneal cavity.

ing, cardiac—are completely disorganized so that they cannot function. Death results quickly unless something can be done immediately to relieve the condition. That "something" is to supply water, if water is not retained by mouth which is quite likely to be the case, it must be given either intraperitoneally (see Harmer, pp. 555–556), or by way of the longitudinal sinus or jugular veins. Often 300 to 500 c. c. of water can be given in a few hours by this intraperitoneal route in the form of normal salt or Ringer's solution. If acidosis is present 10 per cent soda bicarbonate solution may be given in moderate amounts. For its food value and stimulating effect, glucose solutions from 4 to

FIG. 51.—Acute intoxication: Note glassy stare of eyes.

10 per cent in Ringer's solution may be given intravenously. Blood transfusions are at times life saving but whatever is done, it must be done with expedition and with as little manipulation of the baby as possible.

Varying degrees of anhydremia occur from other causes than diarrhea. The persistent vomiting of a pyloric stenosis may be a cause as it brings on true starvation athrepsia and, if prolonged, produces dehydration. Heat, if extreme, and accompanied by an insufficient intake of fluids, or poor body evaporation due to too many clothes and inadequate sponging may be the exciting cause of the dehydration. Inanition fever of the newborn which we have already discussed is really this type of dehydration in a mild form. During acute diseases with high temperatures, dehydration will occur unless sufficient fluids are taken and the skin evaporation properly cared for. If infants recover one

Fig. 52.—Athreptic and toxic infant showing dilated stomach and the folds of skin.

usually finds that an athreptic condition remains and must be more carefully treated.

The Prognosis of both athrepsia and anhydremia is always grave, the younger the infant the greater the danger, in premature and constitutionally weak infants it is usually hopeless after the condition has once developed. Infants who develop athrepsia in the last half of the first year should recover if properly treated providing the stage of tissue breakdown has not occurred and this can only be judged by a careful and intelligent understanding of the infant's reactions to food or by laboratory examinations. Such studies show that blood volume is greatly reduced and that there are marked reductions from the normal of the blood proteins. Such changes are incompatible with life, and unless they can be successfully treated, death must follow.

Treatment. The best treatment consists in preventing these

conditions, removing the cause of nutritional disturbances early, treating infections outside the intestinal tract when they occur, always remembering that during infections the digestive capacity of the infant is lowered. An estimation of the value of the infant's food will quickly tell whether he is being actually starved into athrepsia.

Whatever the cause of the extreme atrophy may be, the principles of treatment are the same (Chart 6). Give as much food as the infant will tolerate, his needs are often 100 per cent more than normal because he often weighs less than half the normal amount for his age. His needs are great, and the normal goal is to be aimed at, i.e., the giving of as many calories of digestible food as a normal infant of that age would require, often 150 or even 200 calories a kilo (75 to 100 calories a pound). Unfortunately they are often unable to take this amount and die as a consequence.

Breast milk is the best available food and is the only type of food for young and delicate infants. It may have to be diluted at first or made more easily utilizable by inoculating the breast milk with lactic acid organisms. Older children do well on protein milk, lactic acid milk or by the addition of accessory foods to their diet, cereals, meat broth, vegetable purees.

At times no recovery of the lowered blood volume is possible without a blood transfusion. These may have to be repeated at frequent intervals before a psychological condition strong enough to carry on the nutritional processes is obtained. If the condition of body break down has gone too far, even transfusions will not save the baby.

At all times it is important for the body heat and vitality to be conserved. This is where skilled nursing care is most effective in saving the infant's strength for carrying on its all-important internal bodily functions. Drugs play no part in the treatment of these conditions except as temporary emergency expedients. Brandy, whiskey, aromatic spirits of ammonia, and best of all camphorated steril oil 2 to 4 min. subcutaneously every 3 or 4 hours are the stimulants used. If, however, stimulants are needed the outlook is usually hopeless unless a rapid blood transfusion will quickly alter the devastating conditions.

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CHAPTER XI

PREMATURE OR CONGENITALLY WEAK OR DELICATE INFANTS

The care of any baby weighing less than 2,300 grams (5 pounds) presents a most difficult nursing problem. Such a baby may be a premature, or a congenitally weak, or very delicate baby. The care of such a baby is practically the same and is a subject of great importance for the nurse.

The question of the weight of these babies is of first interest. Babies weighing as low as 1,000 grams ($2\frac{2}{10}$ pounds) have been saved, but most babies weighing less than 1,500 grams (3 pounds) do not survive. With every hundred grams (one-fourth pound) over 1,500, the chances of life are materially increased. The greatest mortality among these babies occurs during the first 24 or 48 hours because the adjustments to the changed environment are so much greater than in the normal baby, and these adjustments have to be met with organs very much undeveloped. This is particularly the case with the lungs. The first crying of the normal baby that expands the lungs is missing, and it is impossible with these delicate or premature babies to resort to the vigorous methods of spanking and dipping in water to bring about the crying. These babies are too weak to cry, and are utterly unable to stand the exposure such vigorous methods of causing the lungs to expand bring. The cry of these babies is more of a feeble whimper, and has little effect on the expansion. This non-expansion of the lungs continues the fœtal condition of atelectasis which often exists for long periods, or these children may have permanently diminished lung capacity. This non-expansion of the lungs causes the frequent attack of cyanosis, or attacks of blueness, and associated with this is the weak heart action. The whole respiratory and circulatory systems are at a great disadvantage, and the brain centers for these functions are incompletely developed. The heat center is not fully developed and is very easily affected by change of temperature. Slight chilling will lower the temperature way below subnormal. And too much heat will send the temperature high. Both are to be avoided, as the oscillating of temperature

often is fatal because it uses up energy the baby cannot spare. These changes in temperature often occur very rapidly and the chief struggle in the care of these babies is to keep an even temperature of between 80° F. and 90° F. surrounding the baby. Such an evenness of temperature is most successfully secured by having a room for the baby which can be kept at this temperature. Most modern hospitals have developed these rooms for premature and delicate babies (Fig. 53). A room is more successful because it can be better aired than a small incubator, and the risk of exposure is reduced to a minimum. The baby does not have to be bundled up so heavily and all

Fig. 53.—Premature room in University of California Hospital showing cubicle system.

handling and changing can be more readily carried on without changing the baby's surrounding temperature. The humidity of the room should be 55° F. because too dry air is irritating. A large flat pan filled with water will usually keep the room supplied with sufficient moisture. Satisfactory results have of course been secured with the use of the small incubators. The importance of fresh air in the care of these babies has always made the small incubator more difficult to use. Even temperature can be more readily maintained, but fresh air and moisture are more difficult to secure in the small incubator. The handling of the baby is greater with the use of the small incubator as the baby is taken out to be fed and changed. But

with all these disadvantages, the small incubator has, with great care, been made to yield good results.

A very satisfactory home-made incubator is easily prepared as follows: Select an ordinary wooden box a little larger than the baby. Suspend from the top, by a sheet or tapes, a board slightly smaller than the inside of the box. The baby's bed is placed on this board. A door is made in the side of the box near the bottom for the placing of hot-water bottles beneath the bed. The entire box, except the top, may be covered with a sheet. If there is much draft, a sheet may be placed over the top of the box, leaving the head uncovered.

Another excellent method is to wrap the baby in cotton and keep it warm with hot-water bottles in a padded basket or crib. This requires very careful watching of the baby's temperature. There should be a thermometer placed between the blankets and the infant. Due to the dangers of poor insulation, electric pads should never be used unless under constant supervision, as babies have been horribly burned as the result of being left with electric pads. There is danger of burning from hot-water bottles, and these should be most carefully watched. Hot-water bottles, however, cannot set fire to baskets or cribs.

Another important factor in the care of these babies is the supply of oxygen because of the imperfect lung development. It is often impossible for such babies to get enough oxygen from the air and they will have the frequent cyanotic attacks mentioned. Oxygen must be supplied artificially from a tank and it must not be supplied too rapidly or in too great volume. To accomplish this a Wolff bottle is filled about one-half to two-thirds full of warm water, taking care that the short glass tube does not reach the water; while the long glass tube should reach to within an inch or two of the bottom of the bottle. All connections should be air tight. Before giving the oxygen, turn on the valve of the oxygen tank and count the bubbles. These should flow at the rate of six to eight bubbles per minute. The oxygen may then be given in one of two ways, either by connecting a 16-French Catheter with the Wolff bottle by means of a glass connecting tube, the catheter is then placed about a half an inch within the baby's mouth and held there; or the other method is to place one small catheter in each nostril and connect the two by a Y glass tube with the Wolff bottle. This latter method makes continuous giving of oxygen easy. The funnel method of giving oxygen which is so often used really gives the baby very little oxygen and is not strongly recommended. The giving of oxygen may have to be kept up

FIG. 54.—Premature twins being fed with medicine dropper with rubber tip.

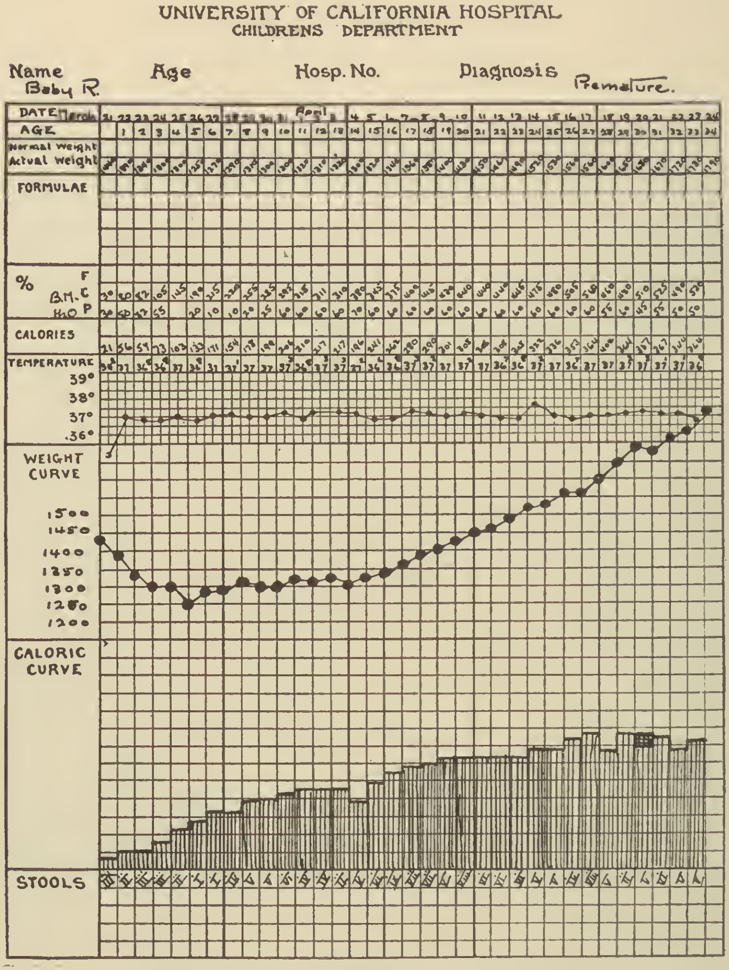

CHART 7.

Legend for

Baby Boy R. (Hospital No. 14883)

This child was premature—seven months, the prematurity being due to a separation of the placenta. The child was born in another hospital. At entrance, the weight was 1440 grams (approximately 3 lbs.). The temperature was markedly subnormal. During the first five days, the baby lost 140 grams (approximately 5 oz.). During this period it was fed small quantities of breast milk by gavage. It could only retain at first five c.c. which was gradually increased to ten and then to 15 c.c. at a feeding. By the end of the first week the baby had started to gain, and after the end of the second week, when sufficient quantities of breast milk could be taken through a Breck Feeder, the child began to gain rapidly. The gain from then on was good. The amount of breast milk throughout can be seen on the chart and also the gain in weight. The feedings of breast milk were

for many hours, even days, until the lung expansion has increased enough to supply the baby with sufficient air.

These babies need for their body maintenance more food value per kilo or per pound than the normal baby. The average normal baby needs 100 calories to the kilo while the premature baby needs 150 calories or more to the kilo. The difficulty is that these babies can only take a very small amount at a time, sometimes as little as 5 or 10 c.c. or one or two teaspoonfuls. The smaller babies are often unable to take this amount by sucking and must be fed with a medicine dropper. It is best to cover the tip with a short rubber tubing. The rubber bulb, glass and rubber tip should all be boiled. Milk is taken up from a sterile container, the infant's mouth opened by pressing on the lower jaw at the chin and the milk expressed into the mouth a few drops at a time. As the premature child grows stronger he will sometimes begin to suck on the rubber end and with gentle pressure on the bulb he will empty the medicine dropper.

Some are even too weak to do this and must be fed by gavage. This is a very delicate procedure and must be carried out by someone accustomed to the use of the stomach tube in infants. The nurse should not try out her skill in using a stomach tube for the first time on a premature. The amount of food can be gradually increased as the baby's capacity increases. Small quantities at frequent intervals, such as one hour, one and one-half hour or two-hour intervals, are better than larger quantities at the usual periods of every three or four hours.

Breast milk is the ideal if not usually the imperative food for these babies, and even breast milk must be diluted for the smallest babies—a one-half water, one-half breast milk dilution. On account of the small quantities taken it is often difficult even with breast milk to furnish enough food values (Chart 7). At times breast milk may be strengthened in value by adding sugar. I have found corn syrup or Karo the most successful sugar to use, owing to its high percentage of glucose which renders the absorption of the sugar more rapid. Most sugars have to be split before they can be absorbed. The rapid absorption diminishes the danger of fermentation and diarrhea.

If breast milk cannot be obtained for all the feedings, I have found protein milk the best artificial food to use for the sup-

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at first diluted, but after the second week the baby took whole breast milk. The baby was kept in the premature room where the temperature was kept at eighty-five degrees Fahrenheit. Several times during the first few days the baby had cyanotic attacks for which he had to receive oxygen.

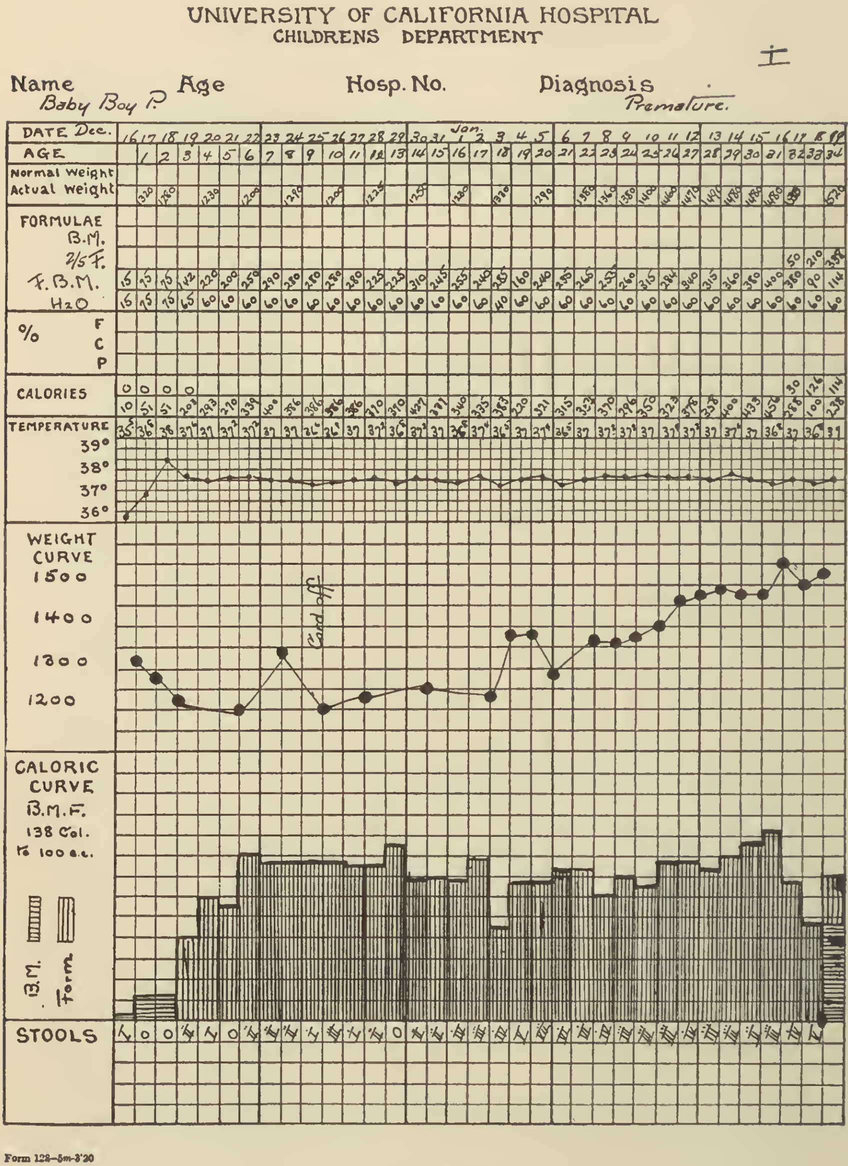
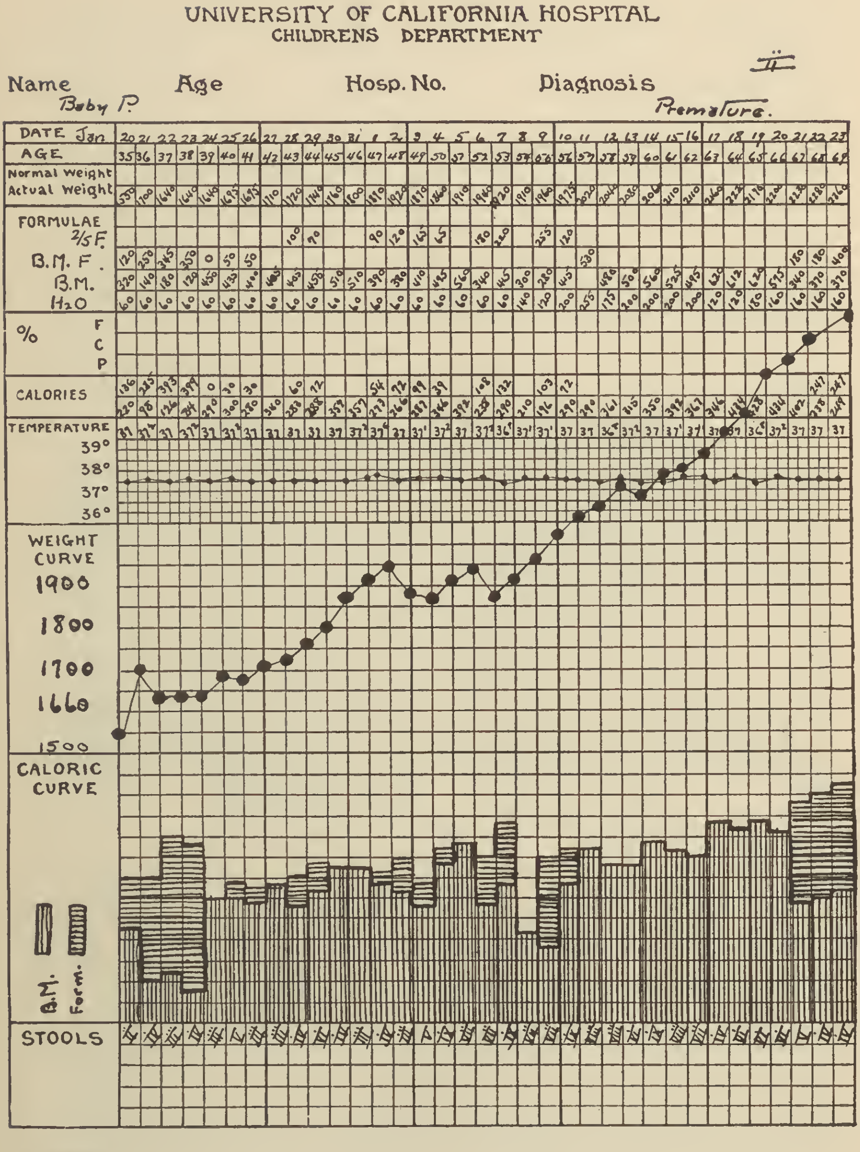


CHART 8.
Legend for
Baby Boy P. (Hospital No. 13756)

Diagnosis: Prematurity.

Baby Boy P. was a seven-month premature infant. Birth weight 1320 grams (3 lbs. approximately). The first chart shows the slow gain in weight on artificial feeding. Although the temperature was subnormal on



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entrance, within the first 36 hours rose to slightly above normal and from that time on remained constantly normal.

The second chart shows a transfer from artificial feeding to breast feeding; the change in the gain in weight is most striking, illustrating very clearly the difficulty of feeding premature children anything but breast milk.

plementary feedings (Chart 8). This protein milk may also be strengthened by adding sugar. Usually 6 or 7 per cent of sugar can be added if it is done gradually. I have given as high as 11 per cent added sugar in some cases, but such feedings must be watched very carefully and the sugar reduced or withdrawn entirely upon the first increase in stools. Vomiting or diarrhea in these babies is disastrous as they cannot afford to lose either the food necessary for their maintenance or the water. These conditions should be stopped, if possible, immediately. The best procedure for the vomiting is the washing out of the stomach with a saline or soda solution. For the diarrhea, paregoric is often the only drug that will affect it.

Changes in the quantity or strength of the food must be

FIG. 55.—A Breck Feeder.

made very gradually. The simple dilutions of milk and water are not very satisfactory in feeding prematures because the food is too weak and they cannot take sufficient quantities to supply the needed calories. The cream and skim milk mixtures discussed in the chapter on artificial feeding are better adapted to the needs of the premature because they can supply more food value in less bulk. If the baby can suck, the Breck feeder can be used successfully (Fig. 55). This bottle is open at both ends with a rubber bulb attached at the free end by which the milk can be gently compressed through the nipple and thus aid the weak baby to suck.

The premature or delicate baby is extremely susceptible to infection owing to its lowered resistance. Respiratory infections must be avoided if possible. Such an infection usually

results fatally, even though it may seem to be nothing but a mild cold. For this reason, no one with any sort of infectious disease, even a cold, should be allowed to have anything to do with the infant or even approach him. At a season when colds are prevalent, it is a safe rule that all persons attending the infant wear a protecting mask over the nose and mouth, whether they have colds or not. These babies are particularly susceptible to pneumonia, which practically always proves fatal.

The exposure incident to the daily bath should be avoided especially in the smallest infants. The baby's skin may be kept in good condition by oiling and the soap and water bath should be given occasionally, depending upon the condition and progress of the baby.

Premature babies do not usually lose as much as normal babies, but after they begin to gain they gain more rapidly,

Fig. 56.—Hood and jacket for premature baby.

often doubling their birth weight in the first four to six weeks and often trebling it in three months. On account of exposure, daily weighing should be dispensed with—even the ascertaining of the birth weight may be delayed several days, as keeping the baby alive is more important at this time than knowing the exact weight. A satisfactory knowledge of progress can usually be obtained by weighing the baby every three or four days.

The clothing for these babies should be the simplest possible in order to cause a minimum of disturbance when the baby is changed. The more robust of these babies after a day or two may be dressed in the usual clothing of the normal newborn, but for most of these babies the simple quilted jacket of gauze, with one end cut and sewed to form a hood for the head, is the best (Fig. 56). This jacket is placed around the baby and fastened in front with tapes or pins, the skin being protected

from the gauze by a small undershirt and diaper. No other clothing is necessary and with such a jacket there is but little disturbance in changing the diaper. Plenty of soft light blankets are added to give the necessary protection and warmth. The whole matter of the clothing has one big objective—to protect and to conserve the baby's energy (Fig. 57).

The gradual removal of the baby from the premature room when the baby gets to be the weight of a small normal full-

Fig. 57.—Premature baby's garments compared with normal baby's size of garments. Premature garments fit large size doll.

term baby, between 2,500 and 3,000 grams, begins by taking him out of the room an hour at a time into a slightly cooler nursery. In doing this the temperature of the baby must be more carefully watched and close observation made of how he is standing the change. When the babies reach the point of being out of the premature room and in the usual nursery for over-night, great care must be taken, as disaster sometimes occurs then, owing to the lower temperature of the usual hospital rooms at night; sometimes the rooms vary by 5° to 10°F.

from their day-time temperatures. If these children are allowed to go home too soon, or if at home, the importance of prolonging all this extra care is not appreciated; often the baby dies after four or five months of careful, successful care.

Experience in the wards of the University of California Hospital demonstrates conclusively the advantages of the newer methods of caring for premature and delicate babies. In our old hospital, small incubators, or artificially heated padded baskets were used, and kept in the nursery. The mortality at that time was about the same as the average mortality in prematures, about 50 per cent (various statistics give the mortality as between 45 and 60 per cent).

In our new hospital with a premature room, our total mortality in prematures has dropped to 23 per cent, and our mortality in prematures who live twenty-four hours is as low as 6 per cent. The nursing care of these cases has been developed upon the individual aseptic basis, and the nurses in the premature room are the nurses who have had their surgical experience in the operating room and who thus bring to the technique of the premature nursing a thorough knowledge of asepsis. The care of premature or delicate babies is not the work of a preparatory student.

The whole advance in the successful care of the premature babies we owe to the nursing care. These babies owe their lives to the gentleness, the skill, the devotion of the nurses who sit hour after hour in the premature room at a temperature of between 75° and 85°, supplying the necessary oxygen, feeding with medicine droppers or by gavage these feeble babies, noting changes from minute to minute, guarding the body temperature, conserving every ounce of energy, indeed waging such a fight for the lives of these babies that those of us who are responsible for the care of such cases know, without any reservation, to whom we owe the successful outcomes. The strain upon these nurses is severe, but their reward is the knowledge that these babies in time, often after two or three years, regain their normal weight, strength and development and take their places in life as normal healthy individuals, showing no scars of the early battle for their lives.

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CHAPTER XII

RICKETS, TETANY, ECZEMA AND SCURVY

These four diseases, rickets, tetany, eczema and scurvy, are also closely related to faults in diet, and are also in a measure related to each other. For the purpose of clearly defining this group we will discuss them under one chapter.

Rickets has probably always existed but it did not come into prominence until what are known as mushy foods began to be used. Modern invention has brought many cereals, foods with high starches, patented easy-to-prepare-in-the-home foods into the market. The refined milling used in the production of such foods has gradually diminished a great deal of the vitamine and natural salt contents of the grains and both these elements are of great importance in the food content. Rickets is not a disease which kills quickly. It is slow and insidious in its approach and in its development, and for this reason it has not been particularly feared by the general public as such diseases as influenza and the plague, although rickets is probably responsible for a greater wastage of life than either influenza or plague. Rickets is a large contributory factor in infant mortality under the age of five years, and this fact is of great importance in the whole fight for the preservation of infant life.

Rickets may be defined as a chronic nutritional disease which creates a particular disturbance in the bones (Fig. 58), although it also affects the muscles and, indirectly, every organ in the body. The whole nervous system is affected and the whole vitality of the child is weakened, and the door to other infections and more severe nutritional diseases is wide open.

The etiology of rickets has received a great deal of attention during the past few years. At the present time there is no definite consensus of opinion as to the exact cause of rickets. It can undoubtedly be produced by a combination of conditions which have to do mainly with diet and hygiene. Of all babies, the premature is the most likely to have rickets, and some go so far as to say that it cannot be prevented in these cases. Rickets is most often found in children who are artificially fed, though it may occur in breast-fed infants, especially breast-fed babies who are kept too long at the breast and who are not given sup-

FIG. 58.—X-ray of late bony changes with deformity at lower end tibia and fibula.

plementary foods after the ninth or tenth month. It is also true that certain races have a greater tendency to develop rickets, as, for example, the negroes and Italians. This is especially true of the Italian immigrants in America. These people leave a warm climate where they have had greater opportunity for air and sunshine out-of-doors and they crowd into our colder cities in dark, badly aired rooms. Their starchy diet is no longer supplemented with a generous amount of fresh fruit and vegetables, easily obtained in their home country, and the result is the rachitic baby and child of our crowded Italian quarters.

Rickets is a metabolic disturbance, and, as far as experimental work has been carried at the present time, it can be produced by a diet which is too low in calcium salts or in phosphorus. There

Fig. 59.—Rickets, showing marked bossing of forehead (hot-cross bun).

is no question but that the balance between the calcium and the phosphorus salts have a great deal to do with the development of this condition. Both of these salts are necessary to the proper development of bone tissue and undoubtedly play a part in the normal functioning of all tissue cells. The rate of growth, combined with the supply of these salts, also has a very definite effect on whether rickets develops or not.

In animal experiments, if the minimum amount of calcium and phosphorus is given and the remainder of the diet is such that the growth of the animal will be slow, rickets may not necessarily develop, provided the animal is kept in the sunlight or is given the rays of a carbon arc lamp; where food is given that produces rapid growth with a minimum amount of calcium and phosphorus, rickets will develop, showing that the rate of growth

has a great deal to do with deciding whether rickets will develop on a minimum diet of calcium or phosphorus.

Numerous experiments have also shown that the lack of a vitamine, the exact nature of which has not been determined, plays a part in the production of rickets. Even with an abundance of these vitamines, such as is found in whole milk or in cod-liver oil (which has 150 times as much of the vitamine as has whole milk), if the salt balance is disturbed, rickets can develop. The action of sunlight and of the carbon arc light and

FIG. 60.—X-ray of early rickets. The epiphyses can be seen to be enlarged, slightly scooped and irregular.

of exercise has also been demonstrated very clearly by experimental methods. That light, sunlight or artificial light of the carbon arc lamp, as well as the influence of exercise, is able to effect a better metabolic state can hardly be doubted.

Symptoms and Signs. An infant suffering from rickets shows as one of the early signs sweating of the head; a broad, square forehead, often with the appearance of bosses in the frontal region (Fig. 59); enlarged epiphyses of the long bones, especially noticeable at the radius (Fig. 60); flaring of the ribs, caused by

the prominent distended abdomen and rosary due to the enlargement of the costochondral junction of the ribs (Fig. 61). This last is an early finding. The prominence of the abdomen is due to the poor muscle tone of the abdominal muscles as well as those of the intestines which allow marked distention of the intestines. Often the rachitic child will not develop teeth until the twelfth or fifteenth month and sometimes later. All the active motor functions of the child are delayed, sitting up, walking, etc.

Fig. 61.—Rickets, showing square head and deformity of chest and large belly.

The various deformities due to static causes—that is, curvature of the spine (kyphosis of the spine)—come about because of improper attempts at having the child sit up. Curvature of the long bones of the legs and thighs is due to the position in which the child normally sits. The characteristic cross-legged position causes marked bowing of the femur and tibia, and too early attempts at standing produce marked bowing of the legs or knock-knees, depending on how the child stands and what the earlier deformities from sitting have been. Rickets occurs most often between six months and eighteen months.

Diagnosis. The diagnosis is not difficult. At times, however, cases give the appearance of hydrocephalus on account of the large head. Sometimes there is a resemblance to cretinism due to delayed growth. Paralysis may occur, but it is pseudo in type and entirely due to lack of muscle tone.

The prognosis of itself is good. The danger is from acute infections, especially of the upper respiratory tract. The real prognosis depends on whether proper dietary and hygienic conditions can be provided.

Treatment. In the treatment of rickets, diet, hygiene and sunlight are of the utmost importance. The diet should consist of milk in not too large quantities. The only possible way of avoiding the condition in the premature baby is to give the baby very small doses of cod-liver oil—from 1 to 2 drops up to 10 drops—once, twice or three times a day, depending upon the size of the baby. As rickets usually does not occur until the sixth month, other foods can be introduced. It is especially important to give green vegetables and not to have an excessive amount of carbohydrates or starchy foods in the diet of these children. Fresh fruits, as well as vegetables, should be introduced, as rachitic children are more prone to develop scurvy if antiscorbutics are absent from their diets. In older children, those over a year, eggs, scraped meat or beef juice can be added to the diet, but especially important are the green vegetables, such as spinach, carrots, and any of the leafy vegetables. Cod-liver oil and phosphorus are the only important drugs. Any child in whom there is a question of beginning rickets should be placed on cod-liver oil and phosphorus. When deformities appear, they can often be benefited by massage and exercises, and even the most extreme deformities will correct themselves in time. At present the general consensus of opinion among orthopedic surgeons is not to operate, unless the deformity is so extreme that the child cannot get around, or at least to wait until the child is considerably older. If the deformities persist till the child is four or five years of age, corrective operations for straightening the long bones can be done. Much, however, can be accomplished by appropriate apparatus and exercise.

Tetany or spasmophilic diathesis are a group of conditions closely associated with rickets. These conditions show themselves by an increased irritability and a tendency to spasm-like contraction of one or more groups of the muscles. This condition occurs generally in bottle-fed babies, especially those who have been troubled with constipation. It rarely ever occurs in breast-fed infants. The attacks are usually preceded by a gastro-intestinal disturbance. It is undoubtedly a metabolic

disturbance through some change in the salt metabolism, particularly that of calcium. This is borne out not only clinically, but experimentally. The nervous irritability can be diminished by giving calcium in large quantities.

The symptoms are very characteristic. These children have a tendency to develop convulsions far more easily than others. They may be thrown into a general convulsion during an examination. There is a characteristic attitude of their thumbs and toes. The thumb is flexed on the palm and the fingers are closed over the thumb; the big toe is flexed, known as carpo-pedal spasm. All the superficial reflexes are markedly increased. The child has a very typical inspiratory crow which is due to laryngeal spasm. At times there is a rolling of the head from side to side as the child lies in bed. This is often kept up continuously.

Diet. In addition to the diet, introduction of foods containing calcium, the giving of large doses of calcium lactate or calcium chloride; 1 gram three or four times a day, fresh air and sunlight are important. The child should be taken off of milk and a liberal carbohydrate diet given for a few days, then skimmed milk or protein milk may be given.

Cod-liver oil and phosphorus will increase the calcium ratio and should always be administered. If the child is having convulsions, chloral hydrate by rectum is indicated. In some instances atropin administered subcutaneously and repeated every six or eight hours is beneficial. Other drugs which have been recommended are magnesium sulphate, chiefly hypodermically when the child is in convulsions; and oxygen should be administered. Sometimes a general anesthetic has to be given, and chloroform is the best, because it is less irritating to the mucous membrane of the respiratory tract.

Preventive treatment is far more necessary than corrective. The prognosis depends on the severity and the age of the child; the younger the child the more severe are the symptoms likely to be. The diagnosis can be very easily made, though sometimes it may be confused with a meningitis because of the convulsions, but the peculiar laryngeal spasm, with its characteristic crow and attitudes of the hands and feet, should make the diagnosis simple.

The third disease, **exudative diathesis or eczema,** is often congenital in nature. The condition of the skin and a tendency to respiratory infections are marked conditions in the disease. Eczema is increased by unhygienic conditions, by wrong proportions or relations of dietary factors, and by surroundings which cause nervous irritability.

The etiology in certain cases is due to protein sensitization.

This is generally hereditary, the family history showing that some member of the family has had eczema, asthma, urticaria or hay fever, a group of conditions closely related. In breast-fed infants certain foods in the mother's diet may cause the eruption, and by omitting these items from her diet the condition will sometimes clear up. In older children a great many proteins may be the cause, eggs and milk being the most common. These can be tested for by cutaneous reaction, obtained by applying dried protein to the scarified area. In a positive case, there is a definite wheel with a reddened area around it. Treatment in such cases is the omission of the food or by giving the protein in gradually increasing doses. In other cases, apparently, there may be no etiological factor. In the breast-fed baby the condition is due either to sensitiveness to protein or to excessive fat. In the bottle-fed baby it is more often the condensed-milk baby that gets eczema, showing that it is due to excess of sugar. In general, eczema is a more frequent condition in cities than in the country, and is more common to the poor than to the rich, because of the greater probability of the right dietary and hygienic conditions among the well-to-do.

The symptoms of eczema appear in two types of babies: the pale, puny and congenitally weak and delicate baby, and those appearing fat and robust, or at least seeming to be robust. In these cases particularly the tendency is always increased by uncleanliness, too high fat in the food, and a nervous environment.

The condition of the skin is characteristic of eczema. There is often a seborrhea capitis present which is at first scaly; then yellow, dry crusts appear. Under the crusts, there is a seropurulent exudate. On the scalp the itching is usually not marked; on the face, the cheeks are covered with a fine, scaly, very itchy eczematous condition, followed by crusts with a serous exudate (Fig. 62).

Intertrigo in the folds of the skin, ears, buttocks, neck, back of knees and axilla is very frequently found. The general appearance of these babies is most repellent. They will rub or scratch their faces until they bleed. The baby is almost frantic and so is the mother in her efforts to relieve the torturing itching. The glands of the neck are often enlarged from the spread downward of the infection from the face. The eczema may spread all over the body.

There is a tendency to upper respiratory tract infections, which are often repeated for very little apparent cause. On account of the fact that the adenoid and lymphatic tissues are enlarged,

chronic infections like rhinitis, pharyngitis, otitis media and bronchitis are all too common.

There is often no definite history of any gastro-intestinal upsets. When there are such upsets they are usually connected with constipation and fatty, soap stools.

The **blood** often shows eosinophilia as high as 15 to 30 per cent at times, especially when the eczema is due to protein.

Prognosis. The principal trouble in eczema comes from the resulting predisposition to infection. These cases have appar-

FIG. 62.—Eczema of face with crusts.

ently a congenitally lowered tolerance to fat. The tendency to eczema passes off during the second year, but these cases often develop at this time asthma or other tendencies which are closely associated with the exudative and spasmophilic diatheses. Sometimes children have very sensitive skins after the eczema has disappeared, or they may for years have a chronic area under the knees, in the elbow, back of the ear, on the neck, etc., which will be difficult to heal.

In the successful **treatment** of eczema, there must be absolute cleanliness and care in all the personal hygiene of the baby.

The diet must be carefully adjusted. Because of the baby's lowered tolerance for fat, other foods must be substituted earlier in these cases. Vegetable food, as well as cereals, for which they apparently have a high tolerance, can be introduced after a third month. These exudative cases are often able to take cod-liver oil when they are unable to tolerate other fats.

The nervous system should be watched carefully in order to avoid the possible development of spasmophilic conditions, as the skin irritation adds to the nervous instability. No medicinal

Fig. 63.—Same as (62) with protective mask.

treatment is specific. Salves, lotions for the eczema, prevention of scratching by the baby by the use of stiff cuffs at the elbows to prevent use of hands for that purpose, and also by close watching to prevent rubbing of face upon pillow or shoulder; facial masks help protect the face from both scratching and rubbing, and all these measures are of great value, but only the proper diet and hygiene will cure the condition. In acutely inflamed eczema, ice-cold boracic-acid solutions often relieve the acute discomfort. The calomine lotions or cream also relieves, or a black wash (lead and opium) may be prescribed to relieve the torture of the acute irritation. Atropin in some cases, especially those showing any spasmophilic tendencies, appears to have a

beneficial effect. Most of the ointments used contain either zinc or some preparation of petrolatum (crude oil).

The following rules in the treatment of eczematous skin conditions have been found to be of great help in handling the case:

1. Use no water on inflamed skin or scalp.

2. Cleanse with a lotion made with equal parts of salad (not olive) oil and lime water.

3. Make a mask from the top of the leg of an old white stocking, cutting holes for each eye and for the nose and mouth. Soak this mask in melted yellow vaseline and keep closely applied to face and scalp (Fig. 63).

FIG. 64.—Arm cuff to prevent scratching or sucking thumbs.

4. Before applying mask spread ointment very freely on skin, face and scalp.

5. When cleansing face, soak cloth in the cleansing lotion and pat it down on to the face gently and remove carefully. Do not rub or in any way injure the skin. Repeat the process until the face and scalp are clean.

6. Elbow cuffs to prevent scratching (Fig. 64). Ordinary cardboard mailing tubes may be used for a small child. Draw the tube over the child's arms up to the axilla outside of the undershirt. Roll the cuff of the undershirt back on to the lower end of the tube and fasten there with a bandage. This precaution prevents the tube from falling off. The axillary end can be padded with cotton so that it will not chafe the axilla. This will

prevent the child from scratching his face and if it is desired to keep him from scratching his body the tubes can be fastened to the sides of the bed. If corrugated cardboard or mailing tubes are not available, a cuff can be made of wooden tongue depressors sewed between two layers of cloth or fastened with strips of adhesive. This will make an effective elbow splint for a small infant, but the ordinary tongue depressors are, of course, too short to be of any use with a larger child.

Scurvy is an old disease with what we might call a rather powerful history, because it has often played a most critical part in the plans of adults. Wherever men have undertaken tasks that restricted their diet, cut off fresh fruit and vegetables, and other necessary food factors, scurvy has had to be fought. Campaigns of armies have been affected by scurvy among the soldiers. Navies have fought scurvy among their sailors. Explorers have faced it in the searches for the poles. Slowly, research has eliminated scurvy as a factor in adult life, and we find the condition to-day largely restricted to babies.

Infantile scurvy is a constitutional disease due to the lack of antiscorbutic factors in the diet. The lack of these factors is more often found in artificially fed babies, especially those fed on foods where the vitamines have been removed by the refining in milling or by heating processes. The greatest number of cases of scurvy occur in children fed on condensed milk. It may occur between the sixth and fifteenth month. As scurvy is several months in appearing, the early symptoms undoubtedly could be detected before the classical signs are present.

Pathology. The most marked tendency of the disease is toward hemorrhage or bleeding. In the typical case the gums are red and swollen, and often have a purplish appearance. If the teeth have erupted they are spongy and often loose. If the teeth have not erupted, the gums are swollen (Fig. 65), tender, and bleed very easily. Hemorrhage under the periosteum of the long bones is very common, but hemorrhage between the muscles and into the cellular tissues about the joints is not infrequent. At times there is hemorrhage from the kidneys, blood appearing in the urine; or blood may be vomited or passed in the stools, showing that there has been a hemorrhage from the mucous membrane of the intestinal tract. Subconjunctival hemorrhage may also appear. These children are always anemic. It has been claimed by many that pasteurization or boiling of the milk is responsible for the occurrence of scurvy. There is no doubt that infants kept wholly on pasteurized or sterilized milk will suffer from scurvy more easily than infants fed on raw milk, though instances of infants fed exclusively on breast

milk have been reported as having developed scurvy. The benefits which have been derived by pasteurization and sterilization of milk far exceed the danger from scurvy. This can be obviated by simply adding a small amount of any of the numerous antiscorbutics, fresh fruit juices, orange juice being the most common, and many of the green vegetables, as tomato juice, or even potato juice, will prevent the development of scurvy.

FIG. 65.—Scurvy—showing reddened swollen gums.

Certain infants have a predisposition to scurvy and it is supposed that these infants are also suffering from a mild degree of rickets (Fig. 66). Rachitic children, who already have a definite metabolic disturbance, will undoubtedly more easily develop scurvy if antiscorbutics are absent from their diet. No child, whether rachitic or normal, will develop scurvy if a sufficient supply of antiscorbutics is given. Every infant who is on

Fig. 66.—X-ray picture of active rickets and scurvy.

a pasteurized or boiled-milk mixture, and especially those on a proprietary food, should be given orange juice or tomato juice continuously. This treatment should be started even in new-born infants put on artificial feedings, and especially is this true of premature and delicate infants.

Symptoms. The onset of scurvy is very gradual. It usually takes several weeks or months to develop. Afterwards the symptoms may appear to be quite acute. There is tenderness of the legs with loss of appetite and loss of weight. The previous feeding history will very often show that there have been some nutritional disturbances, though this is not always true. The attitude in which the child lies in bed is characteristic. The thighs are semi-flexed on the abdomen, the legs are drawn up, and there is an outward rotation of the hips. The infants refuse to move their legs and cry if an attempt is made to handle them. The baby as he lies quietly without pain or discomfort will watch you as you go toward him and will begin to cry before you have touched him.

Crying at the change of diaper is one of the early symptoms spoken of by mothers in describing the symptoms. Otherwise they lie quietly; paralysis of the lower extremities may be suspected because of this fact.

Hemorrhages under the skin (ecchymoses) not infrequently appear at various parts of the body. If pressure or a tourniquet is put on an extremity, like the forearm, small areas of hemorrhage called petechiae will appear. This is due to the change in the small capillary blood vessels which permits the blood to pass through. Such a condition accounts for the appearance of black and blue spots from ordinary handling, such as grasping the baby's heels in raising his legs to change the diaper. Blood may be found in the urine or in the stools or vomitus.

There is always a marked anemia if the condition has progressed or been present any length of time. Evidence of malnutrition—that is, loss of weight and flabby tissues—is usually present.

The **diagnosis** is easily made. The most important factor is the previous feeding history, the age of the child—as the condition most frequently occurs between the seventh and tenth months—the lack of temperature, and all this should eliminate the diagnosis of an acute infectious condition. Scurvy is most commonly confused with osteomyelitis because of the swelling and tenderness of the extremities. Osteomyelitis, however, is associated with high temperature, comes on rapidly, and is not associated with dietary deficiencies. The milder the case of scurvy the more difficult the diagnosis. In early cases, the con-

dition can only be suspected from the fact that the child is restless, shows lack of appetite, general sensitiveness or irritability and pallor. A careful history of the diet will often bring out the fact that either very little or no antiscorbutic food has been given the child. Even on whole raw milk it has been shown that if the cows are not getting antiscorbutic foods, the milk fails to prevent scurvy. Scurvy appears more often in winter and early spring and when the cows are not receiving antiscorbutic fodder. These facts must also explain the rare cases when babies develop scurvy on breast milk; the mothers are not getting sufficient antiscorbutics in their diet.

Prognosis. The outcome of scurvy is in itself very good. However, in scurvy, as in rickets, the danger is not so much from the disease as that the child's resistance to infection is lowered, especially to upper respiratory tract infections.

The treatment, as stated, is simple; the introduction of fresh fruit juices, vegetable juices and beef juice. Children will often recover even if none of these are given and simply raw fresh milk. For the anemia, give green vegetables, and if rickets is present, cod-liver oil and phosphorus are indicated. During the stage of extreme sensitiveness care should be taken that the bed clothes do not weigh on the child's legs. The child should be handled and moved as little as possible. It is remarkable how soon after the introduction of antiscorbutics in the diet the symptoms will disappear, though the swelling and thickening due to the hemorrhages may take weeks before they have entirely disappeared.

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PART II. CHILDHOOD

INTRODUCTION: NORMAL GROWTH AND DEVELOPMENT

As the period of infancy is left behind and early and later childhood become the field of action, would it not be a stimulating procedure for us to consider what the normal is for the child at different stages in his development? Disease is a pathological condition which attacks a well body, an abnormal condition imposed upon a normal condition, and the progress, treatment and cure of such an abnormal condition bears certain definite relations to the normal condition. The whole picture is seldom entirely a "disease" one; there are always certain normal edges left; certain aspects of normality unaffected by the disease. It is comparatively easy to determine that a baby or a child is sick. It is often a most difficult problem to decide whether they are perfectly well and normal. And yet our truest perspective of disease is from the normal, the logical approach to disease is through a study of the normal.

Again the normal adult is no measure for the normal child. The child is not, as we have said, just a little man, but has his own main highway of growth and development to travel on the road to maturity, each stage of which is distinct and individual. The progress of any given disease during any given year of a child's life varies more or less in its effect upon the child, according to the normal growth and development which the child has reached.

We call these successive stages in child life, his growth and development. The evolution of his physical, mental and moral history is indeed the background for all the incident of disease and abnormality that may come. I think for the nursing care of children, a study of this normal background is of incalculable value in meeting the child's diseased condition, be it acute or chronic.

Growth and development are not one and the same process. They ought to be more or less parallel processes in the normal child but normality has a wide field of variations and the so-called normal limit has often a movable horizon line. The relation of growth to development, and of development to growth, are not subjects upon which the wisest of students should be too dogmatic. A child may grow normally but may develop abnormally. He may develop normally and his growth be far from

the normal. His growth process is dependent upon the factors of nutrition and elimination. If these factors are normal, the increase in size which marks the growth process regularly takes place. The development process is the steady increase in the child's power of function, and this power is dependent upon the exercise of the organs of the body and the resulting development of the brain centers related to these organs. We can see from this how lacking in uniformity these processes are, and the evidence is our memory of all the different children we have known and cared for. How periodic and variable these processes of growth and development may be with different children at different ages, we all know. This knowledge prepares us for the patience and skill and long study necessary to establish the *normal,* and when we have established it, we find it not "a straight and narrow path" that leads to normality, but rather a wide zone in which the individual child may do considerable moving about.

Growth. The normal child may vary from one to two years from the so-called average rate of growth, and many factors affect this variation. It is necessary to understand, first, the changes which take place in the various organs during the period of rapid growth in early childhood in order that the child may be protected from dangers and injuries which would affect his normal growth and his normal development. It is a perfectly obvious fact that a child's organs differ in size and in balance from those of an adult. Between birth and maturity the muscles increase many fold in weight, as do the lungs, the heart, and kidneys. The child needs more food and oxygen than the adult and naturally he produces more carbon dioxide, energy, and waste in proportion to his weight than does the adult.

Weight and height are the most tangible evidences of a child's growth, and in the search for the normal, the study of averages has resulted in certain tables which are of great value and use in determining the normality we seek. Much emphasis has been placed on weight and height scales and there is a simple key to the interpretation of the tables which follow.

On the whole the weight to height relation seems to be the best general starting point or base line for observation as to the growth and nutrition of children. It must be borne in mind that the average weight and height of a given group of children cannot be considered the normal. There may be a variation on either side of the average and yet the child will still be within the range of the normal. The normal is not a definite line or figure but rather a zone within which the weight of the child may

fluctuate upward or downward. One cannot say absolutely how far below the average weight for his height the child may be to be considered a definite per cent below normal. We are safe in saying that a child who is between 7 and 10 per cent below the average weight and height for his age is below normal, but if he shows, upon examination, no pathological condition, he may be considered normal. This is not, however, a usual finding as a child 10 per cent below weight usually shows definite physical defects or fatigue or increased nervousness and irritability.

A normal child's growth in both height and weight progresses in a fairly definite degree. The increase in weight does not usually come at the same time that there is an increase in height. The child will grow several inches in height fairly rapidly, and then will take several months to catch up with his weight. During the period of infancy, the increases in weight and height are fairly uniform and regular, but as children grow older, this is not true. More factors which can affect growth enter into the life of the child after the first year. There are periods in which no growth is apparent and these will be followed by periods of rapid gain both in height and weight. There may be no special reason for the rapid gain in weight or height during a given period nor for failure to do so. Where the reason for failure to gain is quite apparent, as with a child suffering from malnutrition, the removal of the causes of this may be followed by a rapid gain. The record of the growth of a child extending over a period of years should be a fairly accurate indication of the condition of his health during that time.

The question is often asked as to whether there is a certain season during the year in which growth is more rapid. Observations point to summer as showing the greatest increase both in height and weight. Dr. L. Emmett Holt says: "The explanation for more rapid growth during the summer season would seem to be that this period includes the school boy's vacation time, during which he leads a more free and more outdoor life; while the winter period includes most of the colds and other respiratory diseases and a large part of the contagious diseases from which those of these ages are likely to suffer, all of which arrest growth and gain in weight."

The following tables showing the average annual increase in weight and height, the average relation of weight to height and the average net weight, height, etc., of healthy children are quoted from Holt's Diseases of Infancy and Childhood.* Doctor

* Holt, L. Emmett, and Howland, John, The Diseases of Infancy and Childhood, Eighth Edition, D. Appleton & Co., pp. 22 and 23.

Holt states that the averages on the children of preschool age are based on personal observations, those above five years are averages calculated from about 100,000 observations on children in public and private schools in this country, compiled from ten different authors.

AVERAGE ANNUAL INCREASE IN WEIGHT AND HEIGHT

Age	Boys		Girls	
	Pounds	Inches	Pounds	Inches
0 to 1 year	14.0	9.0	13.5	8.5
1 to 2 years	6.0	4.0	6.0	4.0
2 to 3 years	5.0	3.5	5.0	3.5
3 to 4 years	4.0	3.0	4.3	3.0
4 to 5 years	4.0	2.5	4.0	2.5
5 to 6 years	4.0	2.0	4.0	2.0
6 to 7 years	4.0	2.0	4.0	2.0
7 to 8 years	4.75	2.0	4.5	2.0
8 to 9 years	5.25	2.0	5.0	1.75
9 to 10 years	6.0	2.0	5.25	2.25
10 to 11 years	5.0	1.7	6.5	2.0
11 to 12 years	6.5	1.8	9.5	2.5
12 to 13 years	8.0	2.0	10.5	2.0
13 to 14 years	10.0	2.5	9.5	2.0
14 to 15 years	12.5	2.7	7.5	1.25
15 to 16 years	13.75	2.71	6.0	0.75
16 to 17 years	6.5	1.2	3.5	0.50
17 to 18 years	5.0	0.5	0.5	0.20

These tables are most illuminating, and the period from two to six years of age takes on new and important significance. The period between the perils of infancy and the entrance to school life has had, in the past, the minimum of attention, and yet during this period the body weight is nearly doubled, the height increased over 30 per cent, and the brain and heart make their greatest gains in size. This short span of four years following infancy is probably the second most sensitive and impressionable period in the life of an individual and has great and determining influences upon the future physical, mental, and moral development of the adult.

Our effort here must be to make clear the position of this period in the growth and development of the child. To do this we must discuss in as graphic a way as possible the definite facts we know and relate these definite facts to our general conclu-

AVERAGE RELATION OF WEIGHT TO HEIGHT
(Weight in house clothes; height without shoes)

Boys				Girls			
Height (Inches)	Weight (Pounds)	Increase Per Inch (Pounds)	Approx. Age (Years)	Height (Inches)	Weight (Pounds)	Increase Per Inch (Pounds)	Approx. Age (Years)
33	28.0	....	2	33	27.0	....	2
34	29.3	1.3	....	34	28.3	1.3	....
35	30.6	1.3	....	35	29.6	1.3	....
36	32.0	1.4	....	36	30.9	1.3	....
37	33.5	1.5	....	37	32.3	1.4	3
38	35.0	1.5	....	38	33.7	1.4	......
39	36.5	1.5	....	39	35.2	1.5	....
40	38.2	1.7	4	40	36.8	1.6	4
41	40.0	1.8	....	41	38.6	1.8	....
42	42.0	2.0	5	42	40.4	1.8	5
43	44.0	2.0	....	43	42.2	1.8	....
44	46.0	2.0	6	44	44.0	1.8	6
45	48.0	2.0	....	45	46.0	2.0	....
46	50.0	2.0	7	46	48.0	2.0	7
47	52.2	2.2	....	47	50.0	2.0	....
48	54.6	2.4	8	48	52.5	2.5	8
49	57.0	2.4	......	49	55.0	2.5	....
50	59.5	2.5	9	50	57.5	2.5	9
51	62.0	2.5	....	51	59.8	2.3	....
52	65.0	3.0	10	52	62.5	2.7	10
53	68.0	3.0	....	53	65.5	3.0	....
54	71.0	3.0	11	54	69.0	3.5	11
55	74.5	3.5	....	55	72.5	3.5	....
56	78.0	3.5	12	56	76.0	3.5	12
57	82.0	4.0	....	57	80.5	4.5	....
58	86.0	4.0	13	58	85.0	4.5	....
59	90.0	4.0	....	59	90.0	5.0	13
60	94.0	4.0	14	60	95.5	5.5	....
61	98.5	4.5	....	61	102.0	6.5	....
62	103.5	5.0	15	62	112.0	10.0	14
63	108.5	5.0	....	63	116.0	4.0	....
64	113.5	5.0	....	64	120.0	4.0	15
65	119.0	5.5	16	65	123.0	3.0	16
66	124.5	5.5	....	66	....	....	....
67	134.0	9.5	....	67	....	....	....

sions. We may well begin with a general statement, and then prove it by particular descriptions of definite processes in the body.

The growth and development of various parts and organs of the child's body does not take place with any uniform rate or

AVERAGE NET WEIGHT, HEIGHT AND CIRCUMFERENCE OF HEAD AND CHEST OF HEALTHY CHILDREN FROM BIRTH TO THREE YEARS.

Age	Sex	Weight		Height		Chest		Head	
		Pounds	Kilos	Inches	Cm.	Inches	Cm.	Inches	Cm.
Birth.....	Boys	7.55	3.43	20.6	52.5	13.4	34.2	13.9	35.2
	Girls	7.16	3.26	20.5	52.0	13.0	33.0	13.5	34.3
6 months	Boys	16.0	7.26	26.5	67.4	16.5	41.9	17.0	43.2
	Girls	15.5	7.03	26.0	66.1	16.1	40.8	16.6	42.3
12 months	Boys	21.0	9.54	29.5	75.0	18.0	45.7	18.0	45.7
	Girls	20.5	9.31	29.0	73.7	17.5	44.5	17.5	44.5
18 months	Boys	24.5	11.13	31.5	80.0	18.7	47.8	18.6	47.5
	Girls	23.7	10.77	31.0	78.8	18.2	46.2	18.0	45.7
2 years...	Boys	27.0	12.27	33.5	85.1	19.3	49.1	19.2	48.7
	Girls	26.0	11.81	33.0	83.8	18.8	48.0	18.6	47.5
2½ years..	Boys	29.7	13.50	35.5	90.2	19.8	50.4	19.5	49.5
	Girls	28.7	13.04	35.0	89.0	19.3	49.1	19.0	48.2
3 years...	Boys	32.0	14.54	37.0	94.0	20.3	51.5	19.8	50.4
	Girls	31.0	14.09	36.5	92.8	19.8	50.4	19.4	49.3

Fig. 67.—Longitudinal section of head and trunk of newborn infant showing the large size of the brain and cavity; the comparatively small flat chest and somewhat larger abdomen with the organs in place. (From the National Pathological and Anatomical Museum, University Institutes, Wien.)

rhythm, nor with any definite relation to each other in the growing and developing processes.

The skeleton. The bony framework of the newborn child is largely cartilaginous and throughout childhood is gradually transformed into bone by the multiplication of the bone cells and

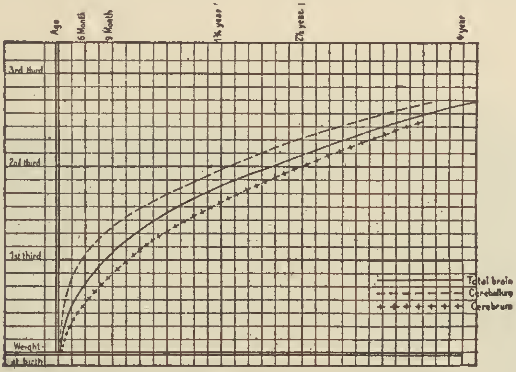

FIG. 68.—Growth of the brain in the first 4 years.

the deposit of lime salts. The centers of development of the long bones are in the epiphyses, and the rate of growth is determined by the condition of these centers. Any injury, infection or disturbance of nutrition in these centers may result in changes

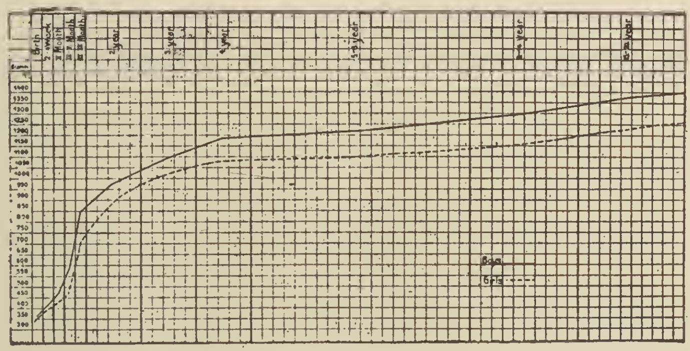

FIG. 69.—Weight curve of brain from birth to puberty.

in growth, such as actual shortening of the bones, or even deformities.

The Head. The growth of the head, at the table shows, is at first rapid. After the fifth year there is only a slight increase in the circumference of the head of the normal child, only about one-half an inch between this age and puberty.

The Skull. (Fig. 67.) The sutures separating the bones of

the skull gradually disappear and the bones become ossified from about the eighteenth to the twentieth month. The small fontanelle closes normally in the second month and the large fontanelle between the fifteenth and twentieth month. If the latter remains open beyond the second year, it is an indication of some abnormal condition such as rickets.

The Brain. During the first four years of life the brain gets most of its growth, more than tripling its initial weight during

Fig. 70.—Brain of a newborn infant showing the brain with very simple markings. (From the National Pathological and Anatomical Museum, University Institutes, Wien.)

this period. From the fourth year to puberty (14 years) there is only a small increase in weight. At birth the brain is about one to nine of the body weight of the infant, at puberty, one to twenty-five and by adult life about one to forty-three. (Figs. 68, 69, 70.)

THE WEIGHT OF THE BRAIN*

Ages	Males Ounces	Females Ounces
At birth (full term)	11½	10
Under three months	17½	16
From three to six months	21	20
From six to twelve months	27	26
From one to two years	33	30
From two to four years	39	35
From four to seven years	40	40
From seven to fourteen years	46	40½
From fourteen to twenty years	48½	44

* Figures given by Boyd and Schafer and quoted from Holt and Howland: Diseases of Infancy and Childhood, p. 643.

The Jaws. The development of the bones of the jaws parallels the development and eruption of the teeth. By the time the child is two years old all the 20 milk teeth are usually present. If there is delayed and defective teething it is due to some nutritional condition, rickets or malnutrition. Since the child cuts all of his temporary teeth and four of his permanent teeth during the preschool period, it cannot be too strongly emphasized that this is the time to prevent dental caries and the defects, i.e., malocclusion, common to the teeth of school children. The bad habits of the baby (thumb sucking, for example) or the faulty hygiene of the household (irregular or no cleansing of teeth and poor diet) are determining factors in the dentition of the school child and the adult. If the school child has a good set of teeth in a normal jaw it is because there was no waste of his inheritance and care was exercised to make the most of that inheritance. The following gives the order of development of the permanent teeth:

First molars	sixth year
Central incisors	sixth to seventh year.
Lateral incisors	seventh to eighth year.
Bicuspids	ninth to tenth year.
Canines	twelfth to fourteenth year.
Second molars	twelfth to fifteenth year.
Third molars	seventeenth to twenty-fifth year.

When permanent dentition is complete there should be 32 teeth. As the permanent teeth grow and push outward they cause atrophy of the roots of the first teeth, gradually cutting off their blood supply so that they loosen and fall out. Teeth are a physiological necessity not only because there is an increase in the flow and digestive power of the saliva with their appearance which makes the utilization of starchy food possible, but also because the function of speech and even nose breathing are facilitated by proper dentition.

The Spine. The lumbar curve is first seen at one or two years but is not continually present until later. At three years the spinous processes stand out in a prominent row and the back is flatter than it is later. At six or seven years the spine is similar to that of the adult and the consolidation of the bodies of the vertebræ probably ends during the seventh year.

Nervous System. Due to the rapid growth of the brain, there is marked instability of the nervous system during childhood with poor development of function. A proper diet is very important to build up the growing nerve cells which must be protected from damage by disease or overwork.

FIG. 71.—X-ray showing normal heart and lungs, and position of the liver.

Thorax. (Fig. 71.) The chest in infancy is small as compared to the abdomen. It usually grows rapidly and by the end of the first year the circumference of the chest equals that of the head. The circumference of the chest at birth ought not to be less than 0.8 or 1 inch less than that of the head. It is considered a sign of feeble development when the circumference of the chest has not exceeded that of the head by the age of three years.

Lungs. The lungs are small in early childhood and during the first and second years the air cells do not attain a proportionate capacity as in adult life.

Rate of Respiration from Birth to Twelve Years, during Sleep.*

At birth	35 per minute.
At the end of the first year	27 per minute.
At two years	25 per minute.
At six years	22 per minute.
At twelve years	20 per minute.

* Holt and Howland: Diseases of Infancy and Childhood, 1922, p. 461.

The Heart. The development of the heart during childhood is rapid. In the first 5½ years of life it more than quadruples its weight and during the next seven years it doubles that weight. This great increase is due to the thickening of the muscle mass in the walls of the heart. The rapid increase in weight from the first to the fifth years renders the heart susceptible to overstrain which may result in permanent damage. Poor hygiene, improper nutrition and overstrain during this period seriously interfere with the normal development of the

SIZE AND GROWTH OF THE HEART*

Age	Ounces	Grams	Volume **	Ratio to Body Weight
Birth	0.50	14	23 c.c.	1 to 225
One Year	1.25	35	....	
Two years	1.87	53		
Three years	2.25	64		
Seven years	2.80	80	100 c.c.	1 to 280
Fourteen years	5.84	166	....	1 to 222
Adult	8.50	241	....	1 to 226

* Holt and Howland: Diseases of Infancy and Childhood, p. 552, Note: The figures in infancy were taken from 155 observations made in the New York Infant Asylum; the other figures with the exception of those on Volume were from Sahli.

** Figures on volume taken from Levy Arch. Ped. 34: 839, 1917.

heart, and the damaging effects of shock, injury, and contagious diseases, particularly rheumatic fever, diphtheria, scarlet fever, bronchopneumonia and influenza, may extend over their whole lives.

The Position of the Heart during infancy is only slightly different from that of adult life. It is somewhat higher and more horizontal and further to the left. The apex beat is usually plapable slightly to the left of the nipple line during the first four years of life, is palpable in or near the nipple line to the ninth year and after the thirteenth year it is normally well within the nipple line. Great variations take place in the rate of the heart depending upon the bodily and mental conditions and the same factors affect the regularity of the pulse.

The child has a large body surface in proportion to his heart which must be kept warm; he must have a quicker circulation and therefore a more rapid heart beat. The blood pressure of the child is lower than that of an adult. The heart is relatively larger in the child than the lungs.

Pulse. From two to six years the pulse rate is from 90 to 105 per minute. The rate is more frequent and variable during this period than in later life. According to Vierordt* the entire round of the circulation is accomplished in the newborn in 12 seconds; at three years in 15 seconds, and in the adult, in 22 seconds.

AVERAGE PULSE RATE IN HEALTHY CHILDREN DURING SLEEP OR PERFECT QUIET*

Six to twelve months	105 to 115 per minute
Two to six years	90 to 105 per minute
Seven to ten years	80 to 90 per minute
Eleven to fourteen years	75 to 85 per minute

*Holt and Howland: Diseases of Infancy and Childhood, 1922, p. 553.

The Abdomen is large in infancy, the circumference being the same as the chest up to two years, after which time it is decidedly less. The umbilicus occupies the central part of the body during the first and second years, but during adult life its distance above the soles of the feet is three-fifths of the body length.

The Mental Development. The development of the skull and the increase in the weight of the brain do not necessarily indicate an increase in intelligence. The development of the skull is due to the growth of the bones of the skull, and the development of the mental traits is due more to the development of neurone cells and connections. The central nervous system shows a remarkable growth in size and weight compared to the rest of the body, but weight is no indication of maturity.

The ripening of the brain cells proceeds rapidly in the sensory centers but more gradually in the frontal portion of the brain from which comes our higher mental powers, associating facts, making judgments, in short what we recognize as intelligence.

As sensation is the basis of all mentality and is dependent upon the stimulation of the sensory nerve endings, we might briefly indicate the most evident of the sense factors, and suggest their development.

Sight. A baby notices the differences in the brightness of colors at about six months. The doctor or nurse's white uniform is noticed and distinguished from one dressed in less brightness of tone. The next step is the perception by the baby of colors, reds or yellows he will like or dislike. Some claim that color discrimination has never been definitely proved before the second year but there is great individual variation in these perceptions we know, from the experience of trying to change the color of some loved doll or toy of a baby we thought too young to know.

Hearing. Pitch discrimination or the ability to reproduce a melody are usually poorly developed in the first few years though there is considerable range of individual variation in this. Fewer than 40 per cent of children under six years, according to Monroe, can give a melody from memory. Perception of rhythm has been noticed in year-old infants and it may be deficient as late as seven years. Children develop the perception of long periods of time very slowly. A child of four will be confused as to "last week" or "yesterday" or "tomorrow." Meuman thinks that complex time concepts are unintelligible to a six-year-old child. In later childhood the sense of hearing is more acute than in adults.

Smell. The sense of smell may develop slowly and may not be fully present until late childhood. This differs in the individual child.

Touch. Tactile sensibility in a child is very acute. The skin sensitivity of a child is greater than that of an adult and practice improves this capacity very greatly.

Speech. The first vocal sound of all babies is the same, the cooing and gurgling sounds. Certain of such sounds become fixed if the child receives notice as soon as he makes the sound, and he very soon has a language of his own. The next step is sentence words, words spoken with certain intonations and accompanied by certain gestures such as the familiar "bye bye" and wave of the hand.

The small child first acquires the names of persons, then the names of objects, verbs, adverbs, adjectives, conjunctions,

preposition, articles and finally the personal pronouns, the latter forming a milestone in the mental progress of the child. The complete sentences are slowly built up from the gradual addition of words for tone or gesture and from the increased mental grasp of the relation of things. Children usually talk connectedly by the third or fourth year. They understand many words which they do not use. A child of five years may have a vocabulary of from 2,000 to 4,000 words. Language progress depends on the two factors of necessity and reward. Mary L. Read in the *"Mothercraft Manual"* gives the following table of the Development of Language:

One to two years.........	Vocabulary of 100 to 500 words; two word sentences.
Two to three years.......	500 to 1,500 new words; begins use of pronouns.
Three to four years.......	Articulation nearly perfect; interest in rhyming.
Five to six years..........	Articulation perfect; inflection of nouns and verbs nearly perfect; interest in nonsense words; use of drawing.

These physical demonstrations of mental development are closely related to definite progress mentally and are more or less positive in indicating normality or abnormality of development. There are certain factors which tend to make a normal individual of which we can be fairly sure. We know what hereditary factors tend to make a normal individual. We are positive of the results of syphilis and tuberculosis. We know what poverty, and alas, what riches will do to undermine a healthy child. We know that every human being has shut up within him "unknown and unusual energy and forces." Because of this, it is imperative for us to know the child, not only from a physical point of view but also his mind, in terms of its equipment, and to know the laws by means of which it may be changed, just in the same way that we know, up to a certain point, fairly definitely how to change the physical condition of a child.

For the physician and nurse, it is equally as important, if we wish to understand the normal child, to know the heritage of that child. A baby is not heir to any ideas. His emotions or ideals are not ready made. He does not inherit consciousness as such. He inherits a complicated system of nerve centers acting and developing according to certain laws of growth. An individual when born is equipped with potentialities of character, intelligence and conduct. Because of the preformed connections or tendencies to connections present in his nervous system, these unborn tendencies which make up the original

nature of the human race are usually classified as automatic, physiological actions, reflexes, instincts and capacities. Automatic action may be illustrated by the heart beat; reflexes by the contraction of the pupil of the eye to light; instinct by such manifestations as imagination, fighting or fear. Capacities are those more subtle traits by means of which, say, one becomes a linguist. This fund of unlearned tendencies is the capital with which the child starts in his mental and nervous make-up, in the same way that he starts with heart and lungs, with muscles and bones that have certain potential capacity for growth and development, achievement and performance. This capital makes progress possible as well as limits the extent to which progress and development in any line may proceed. Our original responses are mechanical. We act merely as a machine until experience or learning in some form affects us.

We need added knowledge of the original equipment of children and effect of sleep, nutrition, age and various kinds of experiences on the organisms. These will increase our power to foretell the responses of any given individual or group to any given situation. We hear of the sensory child of kindergarten age, of the motor child of the primary grade, of the rote memorizing child of grammar grades, and of the reasoning stage of adolescence. Similarly, we are told to expect fear to be dominant at three or four years; doll playing at eight, collecting at nine, and the gang instinct at eleven, the sex instinct in the teens. However, this is often misleading. It seems very improbable that any instinct is absent this week or year and present the next. General psychology teaches that these traits are transitory; they wane and pass away. As James taught, most instincts are implanted for the sake of giving rise to habits. The traits, interests and capacities that are necessary to form into character, conduct and intellect are in the possession of every child for years. The responsibility for their use and development rests upon all of us who come into close contact with child life. In all we do to the sick child or the well child, doctor and nurse are adding their bit to the influences which modify and direct the original capacities and instincts of the children.

We are all born with social and non-social instincts. Our unsocial instincts are mainly connected with our body movements; development of muscle control. It is for this reason that so much emphasis is being put on the control or development of large muscle movement. This emphasizes the value of large movements for little children and the need of free exercise of all movements before the voluntary use of them for some defi-

nite purpose. We make too little allowance for the almost ceaseless activity of the child. These nerve currents which impel ceaseless movement will result later in mental activity which now in the growing child results merely in movement.

A very young child can only sit still for about thirty seconds. A child from five to ten years can hardly sit still for more than a minute and a half. To obey the command to "sit still and play quietly," is extremely exhausting to this store of energy. This instinct is meant to be used, not suppressed. Gesell says, "Why shut children up in the prisons which we have made for ourselves out of inhibitions and conventional standards?" To make them old before their time is to destroy the joy of childhood and injure the vitality of the race.

Unlearned responses to situations accompanied by emotion occur as part of the child's natural equipment; the younger and more inexperienced the child the more evident the emotion. Children's emotions should be controlled, not eliminated; they should be raised to higher levels. To ignore and suppress the energy of these original instincts and to substitute grown-up motives is a dangerous method. The child should be appealed to on his own level.

In meeting most of the mental and spiritual problems of childhood, the force of example is the strongest weapon. We doctors and nurses must not lie to our small patients, or let others lie to them. If we have to hurt them, tell them so. If you tell a child you are not going to hurt him and then proceed to hurt him, you have lost his confidence in your word, and you have given him a lesson in untruthfulness which he will try out himself. Don't promise a child things "to eat to-morrow, if he will eat this to-day" unless you are sure you can carry out your promise; to threaten, to break your promise, to forget small rewards, is to establish grave barriers between yourself and the child.

There are further differences between adults and children in the development of their imagination. The images of children are more vivid and intense than adults; it is sometimes impossible for a child to distinguish between memory images and those of imagination, or even between percepts and images. It is hard for adults to believe, but it is made more credible by psychological experiments. In a child's mind there is confusion between percepts, memory images and productivity images. Punishing a child for this kind of lying when he mistakes one for the other is unfair. It is far better to make children check up their stories with actual facts and so make them realize the difference between the true and the untrue. They should be encouraged to tell

make-believe stories and "true" ones, thus creating a standard by which to judge the real and the make-believe and to recognize the difference.

In the same way, night fears are the result of confusion between percept and images. The best way to obviate such fears is not to allow children to be frightened, for they will recall the emotion in connection with all sorts of things.

This condition between percepts and images is very common among very young children, as shown by the number that have imaginary companions. Often it is a lonely child who develops these imaginary companions. The child's thinking is made up almost entirely of images. That is the reason why dramatization is so important to children; the working out by the child of his constructive images in terms of action. Such dramatization is a valuable means of developing, of making clear the difference between the imagined and real, of developing co-operation, initiative, self-confidence, the use of language and memory. It may only harm if it over-stimulates the emotions.

The greatest physiological fact in the normal growing child is plasticity. "Plasticity means the power of the nerve centers or neurones to be sensitive to what happens to them, and to be changed permanently thereby." Children possess this to an extreme degree. There are certain definite age differences in this plasticity for forming habits. Childhood is the most plastic period; the retentive power in children is known to all of us. None of us are too old to learn. We are still modifiable because we are still plastic, but far less so than we were in our childhood days.

The plasticity of this period is greater along muscular lines than it will ever be again and muscular habits are more easily developed now than ever again; therefore the years before nine are probably preeminently the ones in which to establish good physical habits—the hygiene habits of eating and sleeping at regular periods, of evacuating the bowels, habits of cleanliness, habits of tidiness, habits of posture, carriage of the body, and walking; habits of language, both the mother tongue and modern languages; habits of the use of tools and implements. This is the period when all such habits should be formed. If the habits are good, the child has made a splendid beginning toward being a normally developed child. He has capital the benefit of which he will feel as the years pass. If the habits are bad ones, just the reverse will be true.

In the beginning he may not show his abnormality, but his habits must be either good or bad. Children in these early years cannot help forming habits. It is the nature of their

nervous system to be modifiable. The laws of habit-forming are most important to recognize. "Let a child run until he is six and you never catch him" is a wise old adage based on the importance of habit-forming years.

The nurse in her relationship with the child's home environment, interests and experiences has a great opportunity to help the child to make these adjustments or modifications we have discussed, and to help the mother to appreciate the importance of these more subtle, normal developments of the mind. Many can bring to this nursing task fine practical knowledge of a child's normal physical development, but more and more, nurses must bring to the care of the sick child a knowledge of the normal growth and development of the child's "mind, body and estate."

The nurse has a peculiar opportunity to determine whether a child is really normal or not, because of her field of observation. She watches the way in which a child functions, which has perhaps the greatest bearing upon whether a child is really normal or abnormal. By close observation of the general appearance of the child, the brightness of his eyes, the redness of the lips, the plumpness and rosiness of his cheeks, the way he stands, the way he walks, runs, plays, how soon he is fatigued, how he sleeps, how he eats—in a word, how he functions throughout the day and night—mark the normal and indicate the abnormal.

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CHAPTER I

RELATION OF NUTRITION TO HEALTH

RIGHT FEEDING OF WELL CHILD
RIGHT FEEDING OF SICK CHILD

The relation of nutrition to health is being more clearly recognized each day, and the importance of food in the care of children, sick or well, is being so vividly demonstrated that neither doctor, nurse nor mother can afford to be haphazard in their information regarding suitable food for children of different ages.

Up to this point we have discussed the food of infancy, and that food is largely *milk* of some kind—human, cow or goat. Our chief concern was with the proportion of the various food factors in milk and the adjusting of those proportions to the needs of the baby. With growth and the first small additions of various foodstuffs to the milk diet, the study of food must of necessity be more extensive. The wider field of choice open to the young child and the extension of this field with each year of life make food decisions some of the most important to be made. The child by the second year is rapidly becoming accustomed to new foods and to a new régime of eating, and his three meals a day as to quantity, quality, and proportional food elements are just as important for his growth and development as the food mixtures of the infancy period. Feeding a child is not only an exact science, but a fine art and involves chemistry, physics and physiology, as well as psychology.

The child's body and the food necessary for its nourishment are composed of the same chemical substances. There are from fifteen to twenty such elements, among the most abundant of which are oxygen, hydrogen, carbon, nitrogen, calcium, phosphorus, sulphur, potassium, sodium, chlorine and iodine, and all these elements are combined in a great variety of ways in both the body and the food. The most important of these combinations are protein, fats, carbohydrates, mineral matter, vitamines, water and cellulose or fibers. Our first task in feeding infant or child is to find the right food pattern made up of these elements to fit the needs, and certain of the design is staple; we must give

the food that builds up the body as it grows, all the organs and tissues, and repair all wastes, natural and unnatural. This means muscular power and energy and heat for maintaining the body temperature. This is the task in feeding the well child and the sick child. To accomplish it we must know our tools and how to use them and when to use them and in what quantities to use them.

Protein. This element includes the principal nitrogenous compounds and forms about 18 per cent of the weight of the average man. Protein is of especial value in building new body cells, providing the important element of nitrogen which is needed by children for growth and for repair of tissue. It also serves as fuel to furnish energy. Recent scientific investigation by such an authority as McCollum discloses the fact that there is a great difference in the biological values of the various proteins, due to the varying amounts of amino acids or digestion products. "If the yield of the several amino-acids is such as to make possible the efficient transformation of food proteins into tissue proteins, the proteins have a high value." (From *The Annals*, November, 1921, 34–43, McCollum.) This throws a new light on a possible source of injury to body tissues; those proteins should be used which can be transformed with little waste into tissue proteins.

The chemical structure or amino-acid makeup of milk proteins gives exceptionally high nutritive efficiency to milk. The protein in milk also supplements in an important way the proteins of grains and other seeds. The proteins found in wheat, barley, rye and oats are readily digestible by man and furnish virtually the same energy value, as shown by various studies. Nine-tenths of the protein required by the adult may be met with protein from cereal grains, the remainder being furnished by milk or fresh meat. This is not the case with the child. More animal proteins are required for the child, as they are biologically more efficient in furnishing proteins for growth and repair. The protein from beans seems to be less valuable than that of cereals.

Foods containing High Percentage of Protein.

Vegetables, such as peas, beans and lentils.
Cereals, such as wheat, corn, barley, rye and oats.
Nuts, such as almonds, walnuts, etc.

Milk	Lean meat
Eggs	Fish
Cheese	

Carbohydrates—Sugars and Starches. These furnish muscular energy and bodily heat.

Carbohydrates found as starch in:

Cereals, such as wheat, oats, corn, tapioca, farina, rice.

Vegetables, such as potatoes, beans, etc.

Fruits, such as bananas.

Nuts, especially chestnuts.

Carbohydrates found as sugar in:

Juice of *beets* and *sugar cane.*

Juice of *sweet fruits,* such as oranges, grapes, apples.

Vegetables, such as corn, peas, carrots.

Maple syrup, honey, molasses.

Starch is one of the chief fuels of the body and is supplied mainly in cereal foods. The digestion of starch begins in the mouth by the action of the saliva and is finished in the intestines. For this reason thorough mastication should be encouraged by providing *hard bread* or *toast,* to be chewed without the aid of any liquids. One cereal meal is sufficient at any age, but especially after the teeth have come. The eating of *mushy* foods causes ill-formed and decayed teeth and promotes the tendency toward rapid eating.

Sugar serves as fuel and as flavoring for food. It is found in milk, fresh fruits and other materials. Without small amounts of very sweet materials—sugar, syrup, honey—the diet is apt to be lacking in it. Large amounts, however, markedly depress secretion and delay emptying of the stomach. Candies act in proportion to sugar content and amounts eaten; influenced by flavoring substances and food ingredients (milk, egg, chocolate, etc.) which stimulate gastric secretion. They should be eaten *after,* not before meals. Hard candies, which must be sucked, are better for children than cream candies, because a smaller amount of less concentrated sugar solution is obtained from them. Experiment showed that peppermint oil used as flavoring delayed stomach emptying; caramels gave rise to more gastric secretion, but delayed evacuation; licorice produced considerable secretion, but remained in the stomach for three hours. The addition of honey to bread depressed acid production, but did not delay evacuation.

The craving of children for sweets is not a guide to their requirements. A good plan is to limit sweet desserts to the noon meal. Desserts at the end of the second year may consist of rice pudding, blanc mange, custards, sponge cake, etc. Little sugar should be allowed on cereals or fruits.

Fats. Fat serves as a body fuel and improves the flavor and texture of food. Food cooked and meals served without a certain

amount of fat, butter or cream are unpalatable and lacking in fat. Fats and carbohydrates are the main fuel ingredients of food, the fats being a more concentrated fuel than the carbohydrates. The body is able to transform carbohydrates into fat and with the fat from the food store it in the tissues as a reserve supply of fuel.

Foods Containing Fat

Milk	Egg yolk	Peanuts
Cream	Olive oil	Cocoa beans
Butter	Cottonseed oil	Nuts (except chestnuts)

We know that fat of milk has low melting point and exists in emulsified form, favoring ease and completion of digestion. Nut butter and corn oil are valuable foods for children, well borne and easily digested and absorbed. They are deficient in fat soluble A vitamine necessary for normal growth and therefore should never entirely replace milk fat.

Minerals. These are indispensable to life, though they yield little or no energy. They are used as building material and are found chiefly in the *bones* and *teeth,* but are also present in other *tissues* and in *solution* in the fluids. They also produce substances within the body tissues which offset acid substances formed in the tissues by the digestion of meats and cereals. Small quantities of mineral matter are found in practically all foods. Often a large proportion of this valuable food material is wasted in the process of preparation. In many fruits and vegetables, the mineral matter is just beneath the skin; therefore, it is best conserved by cooking without paring, by baking, stewing or steaming, or by using the water in which the food is boiled. In grains the mineral matter is in the germ and the husks; refined flour and cereals are thus robbed of this necessary food ingredient. Milk contains all inorganic elements or ash constituents required in human nutrition in exceptionally favorable proportions. McCollum points out that a ration consisting too exclusively of cereal grains or other seeds is not satisfactory because of the low calcium content. Milk contains more calcium than meat, which is inadequate in its calcium content.

We have known for some time the importance of the calcium intake to growing children and the tendency of all nutrition students has been to keep milk in the diet of children as late as possible, because of its high calcium content. "A quart of milk a day" for all children has been a popular slogan and has been thought a fad by some, a folly by others, and sound preaching by others. Now, by a careful study made by the New York

Association for Improving the Condition of the Poor, and by Columbia University, a quart of milk a day for all growing children from three to fourteen years of age has been placed firmly on a scientific basis. The experiments have proved the soundness of the quantity, and the fact that children utilize the calcium of milk more efficiently than the calcium of vegetables has been definitely established by intensive experiments directly on the children themselves.

Therefore, milk and green vegetables or edible leaves are essential in supplying the necessary mineral constituents, leaves being much richer than seeds in calcium. Compared with other foods, milk contains much lime but very little iron. Spinach and other green vegetables and egg yolk are very rich in iron; therefore, combinations of these are necessary in the diet. Recent experiments show that when spinach is boiled it loses twice as much of its mineral constituents as when it is steamed.

Iron, lime and **phosphorus** are important elements in the body and are required in the food. The following foods contain considerable quantities of both lime and phosphorus:

Milk	Cabbage	Lettuce	Spinach
Cheese	Carrots	Onions	Turnips
Asparagus	Cauliflower	Parsnips	
String beans	Celery	Rhubarb	

The following foods contain considerable quantities of *phosphorus* but little lime:

Beans	Pea
Barley	Lentil
Lean beef or other meat	Potatoes
Cod or any fish	Whole wheat flour or other whole grain preparations

The following foods contain more *iron* than other foods:

Asparagus	Cabbage	Lettuce
Beans	Celery	Spinach
Lean beef or other meat	Egg yolk	Tomatoes
	Dandelion greens	

The following foods contain a high percentage of *calcium* and *phosphorus:*

Grape juice	Rhubarb	Milk
Orange juice	Maple sap	

The following foods contain a high percentage of *calcium, phosphorus* and *iron:*

Spinach	Apples	Whole wheat
Celery	Prunes	Whole cereals
Peas	Peaches	Egg yolk
Lima beans	Pears	Lean meat (except calcium)
String beans	Dates, raisins	

Water. Water is a component part of all the tissues and one of the most abundant of the food compounds. It constitutes about 60 per cent of the body weight. It is an indispensible food ingredient, although it cannot be burned and therefore does not yield energy to the body. It is necessary in promoting the circulation of the blood and the various fluids of the body and in aiding elimination of wastes through perspiration, the bowels and kidneys.

Water constitutes:

65 per cent of meats
80 per cent of fish
90 per cent of fresh fruit and vegetables

Water is furnished in:

Milk
Cocoa
Soups
Fruit juices
Fruits
Green vegetables

TABLE SHOWING THE VITAMINE CONTENT OF SOME OF THE MORE COMMON FOODSTUFFS

	Fat Sol. "A"	Water Sol. "B"	Water Sol. "C"		Fat Sol. "A"	Water Sol. "B"	Water Sol. "C"
Meats:				*Nuts:*			
Brains	2	3	1(?)	Almonds	1	3	....
Codfish	1	1	(?)	Brazil nuts	....	3	....
Kidney	2	2	....	Chestnuts	....	3	....
Muscle	0	0	1(?)	Cocoanut	2	3	....
Liver	1	1	1	English walnut	....	3	....
Sweetbreads	0	0	0	Filberts	....	3	....
Vegetables:				*Fruits:*			
Beet root	1	1	2	Apples	.....	2	2
Cabbage, dried	3	3	1	Bananas	(?)	1	2
Cabbage, fresh	3	3	4	Grapefruit	....	3	3
Carrots	3	3	2	Grapes	0	1	1
Cauliflower	2	3	2	Lemons	....	3	4
Celery	(?)	3	(?)	Limes	....	2	2
Lettuce	2	2	4	Oranges	....	3	4
Onions	(?)	3	3	Pears	....	2	2
Peas	1	2	3	Raisins	....	1	1
Potatoes, white	0	3	2	Tomatoes	2	3	4
Potatoes, sweet	3	2	2	*Oils and Fats:*			
Spinach	3	3	3	Almond oil	0	0	....
Dairy Products:				Beef fat	1	0	....
Butter	4	0	0	Cocoanut oil	0	0	0
Cheese	2	1	(?)	Cod liver oil	4	0	0
Condensed milk	2	1	0	Corn oil	0	0	0
Cream	3	1	(?)	Cotton seed oil	0(?)	0	0
Eggs	4	2	0	Egg yolk fat	4	0	0
Milk powder, skim	1	3	1(?)	Lard	0(?)	0	0
Milk powder, whole	3	3	1(?)	Oleo, animal	1	0	0
Whole milk	3	3	2	Oleo, vegetable	0	0	0
Whey	1	3	1	Olive oil	0	0	0
Cereals:				Pork fat	0	0	0
Maize, yellow	1	3	(?)	Tallow	0	0	0
Rice, polished	0	0	0	Vegetable oils	0(?)	0	0
Rice, whole grain	1	3	0				
Bread, white	....	1(?)	....				
Bread, whole wheat	1	3	(?)				

NOTE.—4 indicates very abundant; 3 abundant; 2 relatively large; 1 present in small amounts; 0 absent.

Vitamines. The Three Unsuspected Essentials of Diet—

(a) Fat Soluble A is found in butter fat and egg-yolk fat and fats from the interior of the cells of the glandular organs of animals, e.g., the liver and kidneys. Leaves of plants form the next important source. Seeds, tubers and fleshy roots are relatively poor in this substance; those containing yellow pigment are probably richest in it.

(b) Water Soluble B is widely distributed. Common foods lacking in it are polished rice, sugars and starches, fats and oils from animal and vegetable sources; muscle cuts of meat are very poor in it, but glandular organs contain an abundance of it. Food containing small quantities of it are: white flour, degerminated cornmeal, macaroni, spaghetti, and products prepared from bolted wheat flour. All whole-seed products, tubers and fleshy roots, leafy foods, milk and eggs contain it in relative abundance.

(c) Water Soluble C is abundant only in fresh vegetables, fruits and fresh milk from cows in pasture. Cooked and dried foods lose this substance in great measure.

VITAMINES

Fat Soluble "A"		Water Soluble "B" *Antineuritic*		Water Soluble "C" *Antiscorbutic*	
Found in— Butter fat, cod liver oil greenleaves, tomatoes. Destroyed byprolonged heating in open air.	*Prevents*— Malnutrition, the disease Rickets (?) Necessary for growth.	*Found in*— Yeast Cereal germs, vegetables, nuts milk. Most stable. Destroyed by high temperature.	*Prevents*— Malnutrition, beri beri, polyneuritis, loss of appetite. Necessary for growth.	*Found in*— Fresh fruits and vegetables especially orange, lemon, tomato, summer-milk. Easily destroyed by cooking.	*Prevents*— Malnutrition, loss of weight, infantile or adult scurvy. Necessary for growth

Cellulose. These are the indigestible fibres in food—these are of service in forming roughage and sufficient bulk to stimulate the action of the intestines and have a laxative effect.

Foods containing Cellulose:

Whole wheat
Whole cereals
Prunes, dates
Figs, raisins

Fibrous vegetables such as spinach, celery, onions, carrots beets, beans, peas, skins of apples, pears.

Foods lacking Cellulose:

Concentrated foods, such as nuts, cheese, butter, sugar. Refined foods, such as white flour, cream of wheat, cornstarch. Liquid foods.

Laxative Foods:

Whole wheat cereals
Whole wheat bread
Whole wheat crackers
Cornmeal
Bran muffins
Peanut butter
Olive oil
Cottonseed oil.

Figs
Dates
Prunes
Oranges
Apples
Raisins
Plums
Peaches
Rhubarb
Grapes

Pecan nuts
Gingerbread
Honey
Molasses
Spinach
Onions.

Caloric requirements. These requirements depend upon the age, the weight, the activity, the health, often the climate and

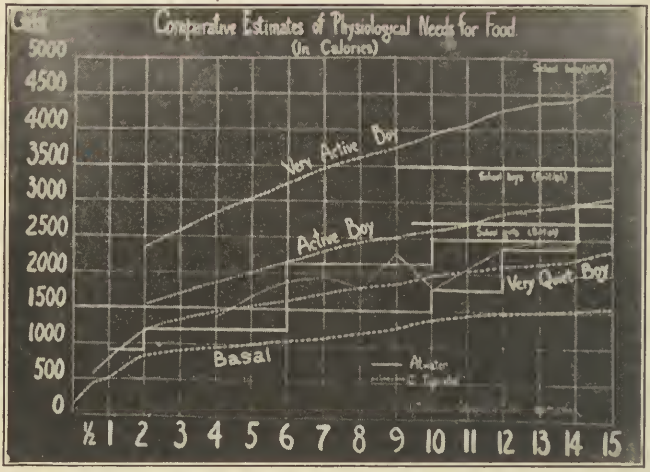

FIG. 72.—Chart showing what the basal needs and the various needs for a very active boy, an active boy and a very quiet boy. (Chart composed by International Scientific Food Commission.)

always the temperament of the child to be fed. The growing child must have a sufficient quantity of energy and fuel foods. The term calorie, we remember, when applied to food means the amount of food that would furnish a calorie of heat when digested in the body. The sufficient quantity then of energy and fuel foods equals the caloric sufficiency for the child and this should never be reached by guess work but by following the scientifically computed tables, and watching closely the effect upon the child. (Fig. 72). Charles Hendee Smith gives a good 100 calorie portion table that is a simple and convenient way of visualizing different amounts of food in terms of calories. One hundred calories comes close to the average helping in many instances as the table shows,

and the nurse will find it of great assistance in being able to quickly compute the number of calories the child is being offered at a meal and the number of calories he actually eats.

(The following table is from "The Nutrition Class," by Charles Hendee Smith, Child Health Organization of America, page 31, 1922):

100 CALORY PORTIONS OF FOOD

Milk	5 ounces (1 glass, 150 cals.)
Egg	1 large, (1 average, 75 cals.)
Meat	2 ounces, (about size of a chop.)
Fish	3 ounces, (about $3 \times 2 \times 1$ inches.)
Pea or Bean Soup	4 ounces, (½ cup.)
Bread	1 slice, about $4 \times 4 \times \frac{2}{3}$ inches.
Cereals (cooked)	¾ to 1 cup.
Macaroni	1 cup.
Rice	¾ cup.
Potato	1 medium.
Sugar	2 tablespoonfuls.
Butter, Oil	1 tablespoonful.
Green Vegetables	1 to 2 cup.
Prunes, 4 average	
Apple, Orange	1 average.

The next great problem in feeding the growing child is to provide a balanced diet. Total calories may be provided in the day's rations without supplying the proportions of elements necessary for the growth and energy demands of the child. This proportion is only approximate as feeding in the last analysis is an individual matter, and the idiosyncracies of children, as the nurse constantly realizes, change the proportion percentages from time to time. The protein proportion lies somewhere between 10 and 15 per cent in a day's feeding. Carbohydrates vary from 50 to 60 per cent for the same period and fat from 25 to 35 per cent. If there is too much or too little of these elements, the child's growth is soon affected. Too little protein retards growth and makes a child overeat in his effort to satisfy his hunger. Too much protein is equally injurious as irritating poisons are thus formed in the (digestive) system. Indigestion will come from excess of fat and carbohydrates, and nerves are starved by too little fat. The nursing problem of feeding the growing child from two to, we might say, eighteen, is all interwoven with this question of food balances and it is never safe to let "what a child ought to be eating" be the only measure of what is given the child. What a child can take, assimilate and grow and develop on is the only measuring rod for the individual child. The nurse must approach that of course, from the normal averages but she must ever be prepared to make different, per-

haps finer discriminations in feeding than can be set down in any tables, and her appreciation of the intricacies of the problem makes her understand the absolute necessity of depending upon the guidance of the physician in charge.

The right feeding of the well child. To make a child eat any food, we must consider his food habits, and the time to train a child in proper food habits, is when he is *well*. To have to train a sick child in proper food habits often jeopardizes his life, or at least takes energy and vitality that ought to be conserved. The child's food habits are related to all his daily hygienic habits. Fresh air, exercise, daily bowel movements, rest periods, quiet sleep, all affect his food habits.

The normal child should eat the food provided, if that food supplies his needs and is well cooked and attractively served. The best way to avoid strong food dislikes in children is to begin early with the properly balanced meal. If the child is offered a diet largely of starches and sugars, he very soon dislikes milk, eggs, fresh meats and green vegetables. Such a diet lacking in these essentials, may not have any immediate serious results but such early diet deficiencies usually show in later childhood, often causing the condition of malnutrition to develop.

The healthy child eats a variety of food and has no special dislikes although some children on a well-balanced diet will show very definite food dislikes. Long continued lack of appetite or freakish desires may indicate illness. Poor teeth or constipation may affect the appetite. But the child who is normal and healthy with proper habits of general hygiene, ought to follow the proper diet, as a matter of course. Most children will do this, if the questions of "what is good for him" or "what he would like" are not discussed before him. The fatal question is "what would *you* like?" That arouses the spirit of adventure in most children and they immediately select something different from the usual régime. To force a child to eat something he dislikes is difficult to do. The whole performance becomes tense, and atmospheric. Tears or sulks are not conducive to appetite or digestion. The well child had better be allowed to go hungry until he has sufficient appetite to eat the wholesome meal.

Mealtime should be a happy time for a child and food should not be discussed. Example is a powerful influence and if grown-ups are careful not to discuss their food likes and dislikes, the child is not so apt to develop them. If father does not like spinach and says so, small son at the table is likely to follow father. Under six years of age, children do better at their own small table where they are not tempted by food which is not

suitable for them but this is only possible for a relatively small group of children because it is considered too much trouble for busy people to take. Such a plan demands constant supervision which is not always possible. The average child comes to the family table and he must learn early to feed himself, not to mess his food around in an untidy way, or to play with his food, or to expect that someone is going to coax him to eat. Food should not be washed down with water or milk, without the proper chewing and if children are reminded to drink plenty of fluids between their meals, they will not want the fluid with their meals. There are a few simple rules in feeding the well child that are of known value.

A short rest period before meals; face and hands washed and hair brushed, not only for cleanliness and neatness but for establishing an attitude toward mealtime and coming to the table that makes of it, an especially happy time for which one wants to appear at one's best; no scolding or nagging at the table; teaching a child to feed himself quietly and properly is no excuse for making meals a nightmare to others and a trial to the child. After learning the technique of handling a knife, fork and spoon the child's table manners depend largely upon what he sees around him.

In feeding sick children, there are certain rules to be observed by the nurse whether the child is at home or in the hospital. The nurse should be sure of the diet the child is to have and should see that no changes or additions are allowed, unless ordered by the physician. This is of particular importance when the child is on a special diet. Parents are naturally more moved by the child's teasing for favorite food and are apt to feel that the physician is too strict, and the nurse has the task of pacifying the parents, pleasing the child and strictly carrying out the orders! The child is often more easily handled than the well intentioned family, as the nurse can win the child's confidence by giving him good reasons why he must eat only what the doctor has ordered and by care and tact and patience, successfully feed the sick child.

Meals should not be served immediately after a painful treatment of any kind or after a crying spell or upset of any kind. A quiet rest period before meals is more important for the sick child than for the well child. To give a child something to eat "to distract his attention" from any of the above conditions is not wise. Get him distracted, yes, but don't distract his stomach.

During illness the diet is especially important and the nurse needs to exercise the utmost patience in persuading a child to eat

the required amount of food. Properly cooked food, attractively offered a sick child may be refused, but usually the tact and understanding of the nurse wins out. In home nursing, it is more easily achieved. In busy hospital wards, nurses are tempted to save time and energy by bringing the child the entire meal at once, and the child will eat what he likes, usually the dessert and leave the more solid food. If the child is on a full diet of soup, meat, vegetables and a sweet, the meal should be served in courses, making every effort to have the child finish one course before the other is brought to him. If the meal is served all at once, hot food gets cold and the elements of anticipation and surprise are eliminated, as many a sick child will eat one course in order to find out what is coming next.

The dietaries given here for feeding children are those I have found satisfactory if properly guided. Different physicians vary as to hours, schedules, ages, and types of food, as these subjects are all more or less controversial. The nurse will meet the doctor with a different schedule, and types of food, which will yield just as satisfactory results. The important point is the intelligent understanding of the child to be fed. The menus given here are simply suggested as examples or illustrations upon which to build one's ideas of the whole feeding problem.

The following dietaries cover the period from infancy to puberty. They have been arranged to furnish balanced diets for normal children of the different age periods. The various menus contain the necessary quantities and calories for the different age periods, and the amount of fat, carbohydrate, protein, salt and vitamines necessary for each. For the child over three years an effort has been made to provide sufficient variety in the menus in order that the child will not weary of the food elements he should be eating.

Supplementary Food for the Normal Infant During the First Year. During the first eight or ten months of life the principal food of the normal infant should be breast milk. The following table is a recapitulation of material from the chapter on Artificial Feeding:

Third or fourth month: Orange juice (occasionally prune or tomato juice) should be added to the infant's diet. Begin with ½ an ounce diluted with an equal amount of boiled water. Give this every other day at first and then every day between the morning feedings.

Sixth month: Begin feeding cooked strained cereals with a spoon, farina and cream of wheat are preferable for an infant. If the infant is on a formula or receiving one or more bottles during the day, some of this may be poured over the cereal; if

entirely breast-fed, about 2 ounces of whole cow's milk may be used as a diluent. Give a tablespoon once a day in the beginning and increase this gradually. Give just before one of the regular feedings.

Seventh month: Start vegetable purees and meat broths, 1 or 2 ounces a day may be given to replace a breast-feeding or formula. As the mother's milk decreases in quantity the amount of these supplementary foods should be increased, and they may be given more than once a day.

Eleventh month: By the time the infant is eleven months old he should be on the following diet:

6 a.m.	Milk, warmed, 8 ounces.
8 a.m.	Orange or fruit juice of some kind, about 2 ounces.
10 p.m.	Milk, 8 ounces warmed; cereal, 2 to 3 tablespoons with thin cream, 2 ounces. Toast, dry and crisp, 1 slice.
2 p.m.	Beef juice, 1 or 2 ounces, or chicken or mutton broth cooked with vegetables, 3 or 4 ounces, and green vegetables, 1 or 2 tablespoons or 1 tablespoon of baked potato, and one slice dry crisp toast with a little butter. A little water to drink.
6 p.m.	Milk, warmed, 8 ounces. Apple sauce or prune puree, 1 or 2 tablespoons. One slice of crisp dry toast with a little butter.
10 p.m.	If the child requires it 6 or 8 ounces of warmed milk may be given in a bottle at this time or 5 or 6 ounces of cereal gruel.

At the end of the first year, the normal infant should be taking five feedings in the twenty-four hours at four-hour intervals throughout the day and leaving an eight-hour interval at night. Nothing should be permitted between feedings except water and the allowed quantity of fruit juice. After eighteen months of age, if the infant will sleep through the night, the fifth feeding should be omitted and the amounts given at the other four feedings proportionately increased. By this time the infant should take his food from a spoon or cup, with the possible exception of the night feeding which may be given from the bottle. The diet should be selected from the following:

1. **Milk,** approximately 1 quart in each twenty-four hours, should be taken, but this amount should not be exceeded. Some of the milk allowance may be used in making a creamed vegetable soup, for example.

2. **Cereal** should be given daily, usually twice daily. Any well-cooked cereal is allowed, but none of the dry "ready-to-serve" cereals should be permitted. Up to fifteen months of age the cereal should be strained and served as a jelly and still later as well-cooked whole grains. Toast, zweibach, arrowroot crackers or dried bread is allowed in small amounts.

3. **Vegetables** are usually best given once daily. They should be well cooked and pressed through a fine sieve before serving.

The infant may have one to three tablespoons of such vegetable pulp at a serving. A little butter and salt or some fine bread crumbs may also be added. The best vegetables for an infant are spinach, peas, carrots, artichoke hearts and string beans.

4. **Meat juice, meat broth and scraped meat** should be given at least two or three times weekly. Scraped meat should not be allowed until the child is at least fifteen months old, and it should be very finely scraped. A chicken or chop bone with the meat removed may be given the baby to chew on by the time he is a year old. The juice and broth are permissible throughout the second year.

5. **Eggs,** soft-boiled or poached, should not be given before the fourteenth month and then in small amounts. The yolk may be given at first and later the whole egg. It is often suitable to alternate an egg with the meat or meat juice after the fifteenth month.

6. **Fruits and fruit juices** should be given daily, from the third or fourth month to a breast-fed baby, earlier if it is necessary to put the baby on a formula before this time. Orange, prune, tomato and grape juice are allowed. Apple and prune pulp are permitted when thoroughly cooked.

"Second Summer". In a past generation, the second summer was considered the most precarious period of an infant's career, and for good reasons. Most infants are weaned by that time, and are having their first experience with artificial feeding. In the days when the milk supply was almost always of questionable purity, and before pasteurization or boiling of the milk had become a custom, many infants succumbed to gastro-intestinal diseases. Now with the feeding of proper amounts of pure food and the exercise of reasonable hygienic care, such as the avoidance of too much clothing, the average infant passes through the second summer with no more difficulties than at any other period of his existence.

Eleven to Fifteen Months.

6 a.m.	Milk, warmed, 8 ounces.
8 a.m.	Orange or fruit juice of some kind.
10 a.m.	Milk, 6 ounces, warmed; cereal 2 to 3 tablespoons with thin cream, 2 ounces; toast, dry and crisp, 1 slice.
2 p.m.	Beef juice with 1 or 2 tablespoons of scraped beef, or one egg and chicken or mutton broth cooked with vegetables and green vegetables, 1 to 2 tablespoons or 1 tablespoon of baked potato, and toast, 1 slice of dry crisp toast with a little butter. A little water to drink.
6 p.m.	Milk, warmed, 8 ounces. Apple sauce or prune puree, 1 or 2 tablespoons. Toast with a little butter, 1 slice.

Fifteen to Eighteen Months.

6 a.m. Milk, warmed, 8 ounces.
8 a.m. Orange or fruit juice of some kind.
10 a.m. Milk, 6 ounces, warmed. Cereal, 2 to 3 tablespoons with thin cream, 2 ounces. Toast, dry and crisp, 1 slice.
2 p.m. Beef juice with 1 or 2 tablespoons of scraped beef or one egg and chicken or mutton broth cooked with vegetables, and green vegetables, 1 to 2 tablespoons or 1 tablespoon of baked potato, and toast, 1 slice of dry crisp toast with a little butter. A little water to drink.
6 p.m. Milk, warmed, 8 ounces. Apple sauce or prune puree, 1 or 2 tablespoons. Toast with a little butter, 1 slice.

Eighteen Months to Two Years.

BREAKFASTS

I. Rolled oats, 3 tablespoons
Whole milk, 3 tablespoons
Dried bread, 1 slice
Jelly, 1 teaspoon
Warm milk to drink, 1 cup

II. Graham mush, 3 tablespoons (strained)
Whole milk, 3 tablespoons
Toast, 1 slice
Butter, ½ teaspoon
Warm milk, 1 cup

III. Milk toast, 1 slice
Dry toast, ½ slice
Butter, as needed
Warm milk, 1 cup
Fruit mid-morning

IV. Cream of wheat, 3 tablespoons
Whole milk, 3 tablespoons
Graham crackers, 2
Butter, if needed
Warm milk, 1 cup
Fruit mid-afternoon

DINNERS

I. Baked potato, 2 tablespoons
Beef juice, 3 tablespoons
Pulp of carrot, 2 tablespoons
Toast, thin, 1 slice
Custard, 3 tablespoons
A little milk or water to drink

II. Coddled egg, 1
On zweiback, 1 piece
Dry toast, 1 slice
Butter as needed
Prune pulp or apple sauce, 2 tablespoons
A little water

III. Milk and spinach soup strained, 1 cup
Soft boiled egg, 1
Baked potato, 2 tablespoons
Sweet cracker, 1
Butter as needed

IV. Beef broth with mashed carrots or asparagus tips, ½ cup
Potato, 2 tablespoons
Peach or prune pulp, 3 tablespoons
A little water

SUPPERS

I. Cereals, 3 tablespoons
Whole milk, 2 tablespoons
Thin bread and butter, ½ slice
Warm milk, 1 cup

II. Milk, toast, 1 slice with asparagus tips, mashed on it, 2 tablespoons
Warm milk, 1 cup
Cracker, 1

III. Bread, 1 slice cooked in ½ cup milk
Cracker, 1
Apple sauce with beaten white of egg baked 3 minutes, 4 to 5 tablespoons

IV. Cereal or gruel, 3 tablespoons
Whole milk, 3 tablespoons
Warm milk, 1 cup
Dried bread, 1 slice with apple jelly, 1 teaspoon

Other vegetables may be substituted for those given above as pulp of string beans, cauliflower tips, summer squash, peas, etc.

In addition to above meals, the baby may have a cup of warm milk when he first wakens and before his breakfast, about 9 o'clock, 4 tablespoonfuls of fruit juice diluted with 2 tablespoonfuls of water.

TWO YEARS

Approximate Food Value—Protein 48, Calories 1,135

Breakfast	Protein	Calories	Dinner	Protein	Calories	Supper	Protein	Calories
Wheat hearts,			Coddled egg, 1	6.6	80	Milk toast, 1		
3 tbs	2.4	72	On zwiebach, 1			slice	3.0	76
Milk, ¼ cup	1.2	25	piece	0.7	33	Milk, ½ cup	2.5	50
Jelly, ½ tsp	.....	60	Dry toast, 1 slice	3.0	76	Asparagus tips,		
Warm milk, 1 cup	4.9	105	Scraped beef, 1			2 tbs	0.9	12
Dried bread, 1			tbs	4.4	33	(Mashed on milk		
slice	3.0	76	Apple sauce, 2	2.0	134	toast)		
			tbs. with beat-			Warm milk, 1		
			en egg white	4.1	16	cup	4.9	105
			Warm milk, 1			Cracker, 1	.5	25
			cup	4.9	105			

Note.—Fruit or a glass of milk with bread and butter may be given at 10 a.m. and 3 p.m.

THREE YEARS

Approximate Food Value—Protein 51, Fat 61, CHO 140, Calories 1,300

Breakfast	Protein	Calories	Dinner	Protein	Calories	Supper	Protein	Calories
Cooked peach, ½	0.3	54	Chicken broth, 1			Bread, 1 slice	3.0	76
Egg, 1	6.6	80	cup	.....	.....	Butter, 1 pat	.....	76
Toast, 1 slice	3.0	76	Roast lamb, 1			Rice, 1 tbs	1.5	34
Butter, 1 pat	.....	76	slice	14.7	150	Sugar, 1 tsp	.....	48
Milk, 1 glass	6.6	140	Baked potato, ½	1.8	74	Milk, 6 tbs	3.0	94
			Bread, 1 slice	3.0	76	Cocoa, 1 cup	7.0	200
			Butter, 1 pat	.....	76			
			Asparagus, 6	1.0	10			
			Junket, 1 cup	4.9	140			

Note.—Fruit or a glass of milk may be given at 10 a.m. and 3 p. m.

FOUR YEARS

Approximate Food Value—Protein 57, Fat 60, CHO 153, Calories 1,380

Breakfast	Protein	Calories	Dinner	Protein	Calories	Supper	Protein	Calories
Sliced Orange, ¾	1.0	48	Beef pat	13.2	98	Cream of vege-		
medium	.....	.....	Rice, 2 tbs	3.0	80	table soup	5.9	150
Bacon, 2 slices	2.1	100	Artichoke with	1.0	64	½ baked potato	1.0	75
Toast, 1 slice with	3.0	76	1 pat butter	.....	76	1 slice toast	3.0	76
½ pat butter	.....	38	Strawberries, 3tbs	1.0	48	½ pat butter	.....	38
1 cup milk	4.9	105	with 1 tsp.			Floating island	6.0	130
			sugar	.....	48			
			2 tbs. cream	0.7	58			

Note.—Mid morning and afternoon milk with bread and butter or fruit.

FIVE YEARS

Approximate Food Value—Protein 62; Fat 62; CHO 172; Calories 1,490

Breakfast	Protein	Calories	Dinner	Protein	Calories	Dinner	Protein	Calories
Sliced orange, 1	1.0	48	Steak, 1 small	18.0	207	Baked potato, 1 small	3.0	100
Soft cooked egg	6.6	80	Rice, 2 tbs	3.0	80	Bread, 1 slice	3.0	76
Bacon, 1 slice	1.0	50	Asparagus, 9	1.0	20	Butter, 1 pat	.....	76
Toast, 1 slice	3.0	76	Butter, 1 pat	.....	76	Gelatin, 3 tbs	2.5	110
Butter, ½ pat	.....	38	Bread, 2 slices	6.0	152	Milk, 1 glass	6.6	140
Cocoa, 1 cup	7.0	200	Strawberries, 4 tbs	1.0	48			

Note.—A glass of milk with bread and butter or fruit may be given at 10 a.m. and 3 p.m

SIX YEARS

Approximate Food Value–Protein 70; Fat 79; CHO 159; Calories 1,600

Breakfast	Protein	Calories	Dinner	Protein	Calories	Supper	Protein	Calories
Poached egg, 1	6.6	80	Beef broth	.....	.....	Cream of vegetable soup	6.0	140
Bacon, 2 slices	4.0	.....	Chicken, 1 serving	15.0	123	Bread, 1 slice	3.0	76
Toast, 2 slices	6.0	152	Asparagus tips, 9	1.8	16	Butter, 1 pat	.....	76
Butter, 1 pat	.....	76	Bread, 1 slice	3.0	76	Hot rice, 2 tbs	3.0	80
Milk, 1 glass	6.6	140	Butter, 1 pat	.....	76	Milk, 4 tbs	2.0	35
Sliced peaches	0.7	64	Potato, 1 med.	4.0	150	Gelatin, ½ cup	2.0	100
			Cooked berries, 3 tbs	1.0	120			

Note.—Mid morning or afternoon fruit or milk and bread and butter if it does not interfere with appetite).

SEVEN YEARS

Approximate Food Value—Protein 79; Fat 90; CHO 23; Calories 2,046

Breakfast	Protein	Calories	Dinner	Protein	Calories	Supper	Protein	Calories
Stewed prunes, 9	1.0	120	Chicken broth with Rice, 1 tsp	.....	15	Baked macaroni and tomato, 3 tbs	9.5	200
Graham toast, 2 slices	6.0	152	Lamb chop, 1	17.0	300	Bread, 1 slice	3.0	76
Scrambled egg, 1 with	6.6	80	Baked potato, 1 medium	4.0	150	Butter, 1 pat	.....	76
Minced bacon, 1 slice	1.0	65	Bread, 1 slice	3.0	76	Snow pudding, 2 tbs	2.0	40
Butter, 1 pat	.....	76	Butter, 1 pat	.....	76	Cream, 2 tbs	0.7	58
Milk, 1 glass	6.6	140	Green peas, 3 tbs.	7.0	93	Milk, 1 glass	6.6	140
			Milk, 1 glass	6.6	140			

Note.—A glass of milk and a slice of bread and butter or fruit may be given at 10 a.m. and at 3 p.m.

TWELVE TO FIFTEEN YEARS

Approximate Food Value—Protein 100; Fat 164; CHO 33; Calories 3,200

Breakfast	Protein	Calories	Lunch	Protein	Calories	Dinner	Protein	Calories
Cooked figs, 2 medium	2.0	200	Toast, 1 slice			Chicken fricassee, 3 tbs	19.0	300
Oatmeal cereal, 3 tbs	4.0	94	Butter, 2 pats	3.0	76	Mashed potato, 2 tbs	2.6	112
Cream, 4 tbs	1.4	116	Bread, 1 slice	.....	152	Buttered celery, 3 tbs	1.0	100
Sugar, 2 tsp	.....	96	Jelly, 1 tbs	3.0	76	Bread, 1 slice	3.0	76
Graham toast, 2 slices	6.0	152	Fruit salad with	.....	120	Butter, 2 pats	.....	152
Butter, 2 pats	.....	152	Mayonnaise, 1 tbs	2.0	140	Cookie, 1	1.0	50
Two eggs	6.6	140	Rice pudding, 2 tbs	.....	152	Apple sauce, 3 tbs	1.0	124
Milk, 1 glass	.....	.....	Milk, 1 glass	4.0	136	Milk, 1 glass	6.6	140
Creamed asparagus	2.5	125	Mutton broth, 1 cup	6.6	140			

Note.—A glass of milk with bread and butter or fruit may be given at 10 a.m. and 3 p.m

Beef Juice. One quarter to one half pound of round steak is broiled slightly and cut into small pieces. Press out the juice with a meat press or potato ricer. Add a small pinch of salt. This may be given as a liquid or mixed with crumbs of dry bread. For feeding do not heat sufficiently to coagulate the albumen.

Scraped Meat. Scrape a piece of round steak (or lamb or chicken which is free from fat may be used) with a knife, shape into a pat and broil very slightly on a hot, dry spider. Season with a little salt and butter. Scraped meat is better than minced meat, as it is free from the connecting fiber, though late in the second year the child may have minced or finely cut meat which has been broiled, never fried.

Eiweissmilch. Heat one quart of whole milk to 100° F. (37.7° C.). Add four teaspoonfuls of essence of pepsin (or essence of rennet*) and stir thoroughly. Let mixture stand until a curd has formed (about ten minutes). Break up curd with fork or spoon and let stand for ten minutes more. Put in a cheesecloth or linen bag and strain off the liquid (whole milk whey) from the curd. Remove the curd from the cloth and press it through a fine sieve with a spoon as a pint of water is being added. Strain the mixture through the sieve again. Strain through the sieve into the mixture one pint of lactic acid milk. Place in bottles and put on the ice. Shake well before using.

Lactic Milk. 1. To one quart of fat free milk add one well pulverized lactine (Parke Davis & Co.) tablet, or any other lactic acid bacillus tablet, and stir well. Add one and one-half

*Note: Rennet makes a quicker but tougher, coarser curd.

to two cups of sterile water and stir again. Place the milk on a shelf and let it stand overnight. In the morning curds should be present. If no curds form, let the milk stand for another twelve hours. Shake well before using.

2. A pure culture of the lactic acid bacilli is added to one quart of fat-free milk and allowed to stand at room temperature for twelve to twenty-four hours. The curd should be firm and solid. Churn or break up curd finely with a fork or egg-beater.

Note: with method No. 2, about four ounces of the lactic milk may be used as an inoculating agent for the next lot to be made. This process may be used daily for at least three months without changing the percentage of lactic acid in the milk.

Sugar Solution (20 per cent).

20% sugar and 80% water.
1 part sugar and 4 parts water.
1 part sugar in a total of 5 parts of solution.

(a) Two hundred and forty grams of any sugar is added to one quart (960 c.c.) of warm sterile water and stirred until a clear solution results. Strain through sterile cheesecloth into a sterile bottle if dirt specks are present, or pour directly into a sterile bottle if the solution is clear.

(b) Two hundred and fifty grams of sugar is added to one litre (1,000 c.c.) of warm sterile water. Proceed further as under "a."

Note: With cane sugar (sucrose) the solution must be boiled five minutes, since cane sugar is refined but not sterilized. Sugars placed in cans under proprietary names are supposed to be sterile. In the absence of sterile water, always boil the water or the solution before using.

Whey. Heat one quart of fat-free milk to 100° F. (37.7° C.). Add four teaspoonfuls of essence of pepsin (or essence of rennet) and stir. Let the mixture stand until a curd has formed (about ten minutes). Break up the curd with fork or spoon and let stand for ten minutes more, or until the curd has settled to the bottom. Strain through four thicknesses of cheesecloth and save the liquid (whey), discarding the curd. Whey should be greenish in color and nearly clear. Heat the whey to 157° F. (70° C.) before using, to kill the action of the pepsin (or rennet).

Note: If the whey is not heated before using, the pepsin (or rennet) is not destroyed and will cause the formation of a curd when added to more milk, thus rendering the milk useless for infant feeding.

Czemy-Kleinschmitt Food. Twenty grams of butter boiled in a saucepan over a gentle fire from three to five minutes. To

this is added 20 grams of wheat flour with vigorous stirring and the mixture boiled from four to five minutes. Three hundred c.c. of warm water containing 15 grams of cane sugar is then added slowly to the butter and the flour and brought to a boil while stirring. The mixture is then rubbed through a fine sieve and is ready for use as a diluent for milk.

Egg Drink. Shake the yolk of an egg, take 4 ounces of orange or grapefruit juice, two heaping teaspoonfuls of milk sugar, or cane sugar enough to sweeten. Put the shaken mixture in a glass, fill up with seltzer water or plain water. Grape juice or loganberry juice may be used in place of the orange, or 1½ ounces of lemon juice.

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School, Teaching Health, Child Health Program for Parent-Teacher Associations and Women's Clubs, Further Steps in Teaching Health, The Lunch Hour at School, Suggestion for a Program for Health Teaching in the Elementary Schools, Your Opportunity in the Schools, Health Training for Teachers, may be ordered from the U. S. Bureau of Education, The Superintendent of Documents, Government Printing Office, Washington, D. C.

CHAPTER II

MALNUTRITION AS A CONDITION

Early recognition of malnutrition is not a simple or easy matter, because it is much more difficult to define a general condition than it is to describe a particular disease. The condition of malnutrition in infancy, as we have seen, has a more immediate relation to acute conditions very largely because of the more limited life of the baby, the lesser resistance to infections, the more restricted environment, the more simple diet, the fewer factors operating from the outside. With childhood, malnutrition as a condition is affected by the ever-widening environment, by greater resistance, by the fast-accumulating habits of all kinds, by increasing activities, and by the very natural decrease in the constant supervision that was so large a part of infancy. The child suffering with malnutrition may not be a sick child in the accepted sense at all. He may be a child whose lowered resistance induces many acute attacks of infection; or he may be a child sort of drifting along in a more or less negative condition of health, nothing very much the matter, and yet nothing very clearly right—a more or less blurred picture, we might say. For the nurse or mother, nothing is more important as a guide to detecting the condition of malnutrition than a clear picture of the normal child with normal nutrition, and the physician, cut off from any constant observation of the child, must depend upon the accurate observation of the nurse or mother when he sees the child in his office, or upon the public health nurse when the child is examined at school. He must depend upon others for the salient points.

The physician recognizes the condition of malnutrition, but the causes of the condition involve everyone who has anything to do with the child, and the entire hygienic background of the child's life. To effectively combat the condition of malnutrition, there must be early recognition and treatment, and to-day, pediatricians, nurses dealing with children, and all public agencies of health and education are studying the problems of nutrition and malnutrition in order to meet this need of early recognition. The malnourished child must be compared with the well-nourished child, not with the sick child.

The physical examination of school children marked the beginning of the effort to combat malnutrition. These examinations revealed such a high percentage of under-nourished children that some plan for correcting the condition and for preventing the condition became imperative. The first plan concentrated quite logically upon the already malnourished children, and various cities started nutritional classes for these children, feeling that the children were more likely to be interested in their own problem if they were stimulated as a group to meet certain standards. These classes very quickly demonstrated certain values, and under-nourished children were by wise and persistent care brought up to the normal. The fundamental weakness of the nutritional class idea is the fact that it segregates the children, putting all under-par children together, thus emphasizing the difference between them and their healthier schoolmates, and by this segregation of malnourished children in no way preventing the spread of the condition among the other children. If our aim is to get the best type of physical development of the race, we must have health instruction for every child from kindergarten through high school, and the subject of health should be an accepted part of every school curriculum. Health is the essential factor in all school achievements, mental or physical, and this relation of health to the sum total of life should be given every child in every given grade. Regular physical examinations and weighing and measuring are of course part of the normal school routine and are the index of the state of a child's nutrition. The nutritional class for those markedly under-nourished is a necessary treatment measure, but no plan is comprehensive that fails to, as quickly as possible, see that the special class becomes unnecessary. The public effort must be to prevent the condition of malnutrition and the shortest route is to educate the individual children in the positive aspects of health. When Belgium was starving, the problem of her children could not end with feeding the debilitated children. Her well, normal children had to be so fed that they ceased to slip into the debilitated group. And so the standpoint of the public on malnutrition becomes the same as that of physician and nurse. It is the problem of the individual child.

The typical malnutrition picture. The child suffering from malnutrition is usually 10 per cent or more below the weight for his age and height. He may fail to gain over a long period, or even lose weight. He has poor muscle tone and development and the elasticity of his tissues is poor. His subcutaneous tissues are soft and flabby. Sometimes he is pale, at other times he may have a high flush of color, the result of over-excitement or

perhaps temperature. He may have round shoulders, winged scapula, prominent abdomen, and flat chest, a posture indicative of fatigue (Fig. 73). He shows a lack of resistance to ordinary infections. He is either nervous and irritable or dull and apathetic. He is seldom hungry, or if he is hungry, he wants the kind of food he should not have. He is a poor sleeper and usually awakens tired and cross. His work in school is usually

FIG. 73.—Malnutrition showing pigeon breast and bad posture.

below the standard of the class and he struggles from grade to grade. He usually looks older than his age.

Underweight is but too likely to be accompanied by physical defects which, if they were remedied, would simplify the correction of some of the bad health habits. The average of physical defects in the child suffering from malnutrition, ranges from four to six, many of these not serious and the majority of them remediable. On the other hand, children more than 20 per cent overweight have an average of less than two defects. "A defect

may be either the cause or the effect of malnutrition. Those that consist of inflammatory processes are usually causes, while postural defects are usually results" (William R. P. Emerson: Nutrition and Growth in Children, D. Appleton & Co., 1922). Only a complete physical examination will reveal all defects.

Of the physical defects which often accompany malnutrition, naso-pharyngeal obstruction is the most important. A common symptom is mouth-breathing. Tonsils usually do not become infected before the age of five or six years, but adenoids are dangerous during the pre-school period because of the small size of the naso-pharynx. Defects in dentition are generally associated with malnutrition. Chronic absorption of toxins from abscessed teeth has a bad effect on nutrition.

Causes of Malnutrition. If it is sometimes, even often, difficult to definitely determine upon the condition of malnutrition in the child, it is infinitely more difficult to determine the cause of the condition. Rarely does any *one* cause dominate. Malnutrition is almost always caused by a combination of factors; physical defects, faulty diet, faulty hygienic habits, fatigue, bad posture all may enter into the cause of the condition.

Syphilis is sometimes found to be a cause of malnutrition in extreme cases, and a radiographic examination of the long bones and Wassermann test should be made as a routine. Tuberculosis is usually present in the lymph nodes with malnutrition as the only sign. Here, too, X-ray of the chest as well as tuberculin test are important procedures. Pyelitis is occasionally found, especially in girls. Repeated urine examinations are sometimes necessary to detect it. Temperature charts may assist in some of the obscure infections associated with malnutrition. Undernourished children often run a slight evening temperature. Subnormal temperatures are indicative of low vitality. Intestinal parasites lead to malnutrition and microscopical examination of the feces is necessary to determine the presence of these. Intestinal adhesions of chronic appendicitis, if suspected with malnutrition, may be discovered by X-ray. Eczema or skin eruptions accompanying bronchitis or asthma may indicate anaphylaxis and are not infrequent. Cutaneous protein tests assist in the arrangement of a suitable diet.

While deformities are a mechanical factor in malnutrition, it is also true that malnutritive conditions produce mechanical defects. Dr. Louis Schroeder of New York City in 1919–1920 examined 2,000 children for the Association for Improving the Condition of the Poor. He found a startling number of orthopedic defects in the pre-school children. Deformities which automatically corrected themselves were those of the extremi-

ties; continuing defects were those of the thorax, spine, etc., the more serious deformities. Often a child in his efforts to train his muscles to correct some deformities of the long bones will, by the overuse of certain muscles to accomplish this, bring about bad habits of posture which will persist long after the original defects have been corrected. All experiments along this line show the important influence of proper nutrition in preventing postural defects.

Where malnutrition is the primary condition from which the child is suffering, faulty health habits are the principal cause of this. Given a child with no physical or medical defects, there is no reason for failure to gain except faulty food habits or environmental conditions.

Treatment or care of Malnutrition as a primary condition. Health habits of eating and living are, as we have said, the chief cause of such malnutrition. We have fully discussed the right diet for children of all ages, but the best food in the world will not save a child from malnutrition if that food is irregularly given to a child without exercise, or fresh air, without proper sleep, or baths, or regular bowel movements. Right feeding must go with right living. If childhood, early and late, could preserve the usual regularity of the infancy period in all such matters, fewer children would suffer from malnutrition.

The following table, prepared by Dr. S. Josephine Baker, if enforced by parents, will go far toward correcting some of the faulty hygiene:

HOURS OF STUDY, PLAY AND SLEEP

Age	School hours	Home Study	Meals and Play	Hours of Sleep	Bedtime.
5 to 7 years...	3	None	9	12	7 P. M.
7 to 10 years...	5	None	8	11	8 P. M.
10 to 12 years...	5	1 hour	8	10	9 P. M.
12 to 14 years...	5	1 hour	8	9	9:30 P. M.

The child has far greater need of sleep than the adult. Children of highstrung and nervous parents are especially in need of long hours of sleep and they are often in the group of the malnourished.

The following minimum table of sleep is quoted from "The Role of Fatigue in the Malnutrition of Children" by Borden S. Veeder (Section on Dis. of Ch., J. A. M. A., pp. 29-49, 1921). It is based on the amount of sleep of physically fit children:

Age	Hours
From 1 to 2 Years................	13
From 2 to 4 Years................	12
From 4 to 6 Years................	11
From 6 to 10 Years................	10
From 10 to 14 Years................	9

Most normal children take more sleep than is given in the above table and an active child who sleeps less is nearing the danger line. For the malnourished child from two to three hours more sleep should be added to the above figures, part of which can be taken in the daytime. Rest for this child shortens his periods of activity, prevents undue fatigue, calms the restless over-active nervous child, induces sleep during the daytime and sound sleep at night, increases his power of assimilating food, promotes proper development and gain in weight and height.

Good results have followed the introduction of proper habits of rest for undernourished children. It may not be possible to adhere rigidly to the schedule in the beginning, though certain rules are necessary for children suffering from malnutrition. The best plan is to limit the amount of violent play at first and insist on a certain amount of time in bed, the routine to be regulated by resultant gains in weight. As the child learns the relation of rest to gain in weight he will begin to limit his activities voluntarily. There is no better method of "slowing up" the over-active, underweight child than by introducing sufficient periods of rest.

It is always best for the nurse to make definite suggestions for the rest a malnourished child needs as the word rest may be but a "glittering generality" unless care is taken.

First. Regular rest periods be enforced both morning and afternoon, the minimum being one-half hour in the middle of each.

Second. The child should be put into a proper position in bed with face away from the light, and if not undressed, the clothes loosened so as to give perfect relaxation. There should be an abundance of fresh air in the room. A pillow placed below the shoulders when lying on the back or under the abdomen when lying on the face is useful in overcoming the fatigue posture.

Third. If the case of malnutrition is extreme, several days of rest in bed are most valuable or one day in bed at various intervals. Breakfast in bed may also serve to prolong the rest period.

Good nutrition cannot prove itself with a child who goes to bed late or is allowed to attend "movies" or to indulge in exciting play in the evenings. Conditions associated with sleep also need attention. Poor ventilation of the sleeping room, too much heat or cold, a noisy room or a bed shared with a restless brother or sister, make it difficult for the child to get the required amount and kind of sleep he needs. His bed may be

improperly placed so that during the summer, light wakens him too early. Bedding is an important point, it may be too heavy to allow him to sleep soundly and comfortably.

If his malnutrition is partially due to an improper diet and faulty food habits, he may have been unable to sleep because he had too much or insufficient food before going to bed. The sequel is a natural one. He comes to his breakfast with no appetite or he dawdles about getting up and has no time for a proper breakfast and bowel movement. He may eat a cold breakfast while he hunts school books, toys or a hat, and escape before his mother realizes that he has eaten almost nothing or worse than nothing.

By recess time if his appetite has returned, he seeks candy or cakes to satisfy it. If the home and school are not near each other, the child must either carry a cold lunch or arrive home tired from the rapid walk with the necessity of rushing back immediately after he has swallowed his lunch. Children are too apt to eat only the dessert in the lunch basket. If a child comes home for lunch he should be assured of sufficient time to eat it and it should be served to him warm. Hurry to return to play, and cold unpalatable lunches will not solve the problem.

Lack of fresh air and sunshine is another important factor in malnutrition for which environmental conditions again are responsible. Some children have most of their playtime consumed by extra lessons in dancing, music, languages, etc. Too many parties as well as too many home lessons may be the reason they do not get enough fresh air and sunshine or enough sleep. The right type of recreation is as important as the right amount. Often the malnourished child is just the one who will sit by the hour pouring over a book because he hasn't sufficient energy to make play agreeable. Too hard play also has bad effects as fatigue and poor posture are first cousins.

Our malnourished children are usually not sick. They may have one or more physical defects, not serious in themselves, and naturally these must be determined and corrected as a first step. Certainly the second step is the acquisition of proper health habits. To clear up the condition of malnutrition, it is necessary to have the parents working toward this end but it is far more important to have the child interested in working for himself. It would be well for the nurse to inform herself as to the various methods of interesting children in health habits. The American Child Health Association has called the following "The Rules of the Game" which is one of the methods I have in mind:

"A full bath more than once a week.
Brush the teeth at least once a day.
Drink as much milk as possible but no coffee or tea
Sleep long hours with the windows open.
Eat some fresh vegetables and fruits every day.
Drink at least four glasses of water every day.
Play part of every day out of doors.
Bowel movement every morning."

The nurse is so often asked for advice and she needs to have suggestions at her finger tips for willing mothers who do not know how to go about gaining the co-operation of their children when they have perhaps made a bad start. If we can persuade the malnourished child to follow these rules and see that he has a correctly balanced dietary, much will have been accomplished.

The amount of food required to make an undernourished child gain in weight is occasionally three or four times that necessary for a normal child. Regular and more frequent feeding is usually essential. The following are important rules of diet in malnutrition.

1. Food must be sufficient in amount. As has been said, sometimes three or four times the quantity necessary for a normal child is required. This can be supplied by adding a mid-morning and mid-afternoon lunch to the usual three meals a day.

2. The food must be suited to the digestion of the child. Cereals should be thoroughly cooked and served with very little sugar. In general, fruits should be cooked, raw fruits being introduced with caution. Green vegetables should be cooked and mashed. Bread should be hard or toasted. Meat well prepared once a day is used to advantage.

3. The food must contain the necessary elements for growth. Milk supplies all the elements needed as well as the essential nutrients called vitamines in the most digestable and economical form. For this reason milk should be the staple article of diet of the child; for the undernourished, the quart of milk a day ration is most important. Care should be exercised not to force too much milk on a child and deprive him of the necessary solid foods. By using milk in cooking, soups, beverages, puddings, etc., its nutritive value may be added to other foods. McCollum (Newer Knowledge of Nutrition) says he is unable to make satisfactory diets without milk, eggs, or leaves of plants as prominent constituents, these being classed as "protective foods." All the nutritive material necessary for growth—milk, eggs, cereals, fruit, green vegetables and stale bread, sup-

plemented by cream, butter, potatoes, and a little pure candy and sugar in some dishes, should gradually be introduced into a child's diet.

4. Food should be given at proper intervals, not irregularly or between the meal periods.

5. Food should be eaten slowly and thoroughly chewed. He should be taught to feed himself early and he should not be allowed to play with the food on his plate. Mastication is very important when the child begins to have solid food. It promotes proper development of the teeth and jaws and it has a corresponding effect on the growing power of speech. Chewing and mastication should be encouraged from the age of two years by providing hard bread sticks, toast and crackers for the child to chew.

6. The dietary for the undernourished child should be so arranged that he will eat all the food given him and not become "finicky" or dawdle over his meals. This can be done by giving smaller and more frequent helpings, omitting an occasional meal if necessary, regulating the amount of fresh air and exercise, offering a variety of foods, and varying the preparation and serving of the same foods.

7. Psychological attitude. The pleasurable emotions should be stressed, and food dislikes and abnormal conditions disregarded as far as this is possible. An atmosphere of cheer at meal time has a favorable physiological influence on the organs and processes of digestion. Especially at the impressionable period of life from two to six years, gain and growth may be made a game, an affair of real happiness and joy.

It is apparent from the foregoing rules that the nutritional problem is intimately tied up with the child's home environment and it is here that the nurse has the advantage. The physician can only guess at the faulty food and health habits if the child has no physical defects to account for the malnutrition. The nurse, as a member of the household, even though only temporarily so, sees the lack of control, the mother allowing the child to eat improper food, fried foods, too much meat, sweets, tea or coffee, anything to get the child to eat. She sees inattention to the child's eating habits, he dawdles over his meals because he is not hungry or he washes down his food with milk or water. He calls for food at irregular intervals and is allowed to have it. The mother excuses herself by saying, "He is so thin that I never deny him food when he is willing to eat it."

A child's health habits are formed at a very early age. Often before he is two years of age, he has been allowed to form

bad ones, both of the type just noted as well as those relating to hygiene. Wherever the nurse comes in contact with the home, either while in charge of a sick patient or as a school nurse, interested in the health of the children of her district, she should have her eyes open to the child's environment. With tact she may be able to bring home to the mother the advantages of good health habits. And more, she may be able to interest the child himself in good health habits. A child is not interested in the idea of health in the abstract. His attention is arrested by it only when it touches his present needs and brings immediate results (Fig. 74).

For a quick summary of this condition in a form easy to remember, and of great value to a nurse in answering the many questions of anxious mothers, or in guiding a mother out of deep waters not only with the child suffering from the actual condition of malnutrition but with the other children who may be well on the road to the condition, the following outline is given:

Cardinal Factors in Malnutrition

I. Diet:

- A. *Fault Eating Habits.*
    1. Hurried meals.
    2. Irregular meals.
    3. Imperfect mastication.
    4. Eating between meals.
    5. Too much candy, sweets.
    6. Dawdling at meals.
    7. Overdrinking at meals.
    8. Insufficient water between meals.
    9. Tea, coffee habit.
    10. Refusing to eat what is put before him.
    11. Overfeeding.
- B. *Lack of Appetite.*
    1. Defects and Diseases.
        - a. Adenoids, tonsils.
        - b. Decayed teeth.
        - c. Constipation.
        - d. Refractive error.
    2. Failure to Eat Breakfast.
        - a. Poor ventilation.
        - b. Disturbed sleep.
        - c. Heavy night meal.
        - d. Insufficient food.

CORRECT POSTURE FAULTY POSTURE

CORRECT POSTURE FAULTY POSTURE

Fig. 74.—Correct and faulty posture standing and sitting.

   e. Unpalatable food.
   f. Too late to bed.
   g. Anxiety to get to school.
   h. Standing up at meals.
   i. Lack of variety.

3. Failue to eat lunch.
   a. Hurry to return to school.
   b. Cold lunch.
   c. Hurry to play.
   d. Weariness from rush to get home.
   e. Unpalatable and improper food.
   f. Eating at school.
4. Lack of fresh air and sunshine.
   a. Home lessons.
   b. Movies.
   c. Parties.
   d. Extra lessons in dancing, music, drawing, languages.
   e. Inadequate clothes.
   f. Unsociability.
   g. No place to play.
   h. School bound.
   i. Invalidism.
5. Bad habits.
   a. Heavy dinner, poor breakfast.
   b. Insufficient time at meals.
   c. Lack of harmony at meals.
   d. Irregularity.
6. Fatigue.
   a. Too long play, exercise and hikes.
   b. Too strenuous play, exercise and hikes.
   c. Poor statics.
   d. Overwork (factory, farm, home).
7. Insufficient sleep.
   a. Late to bed, early to rise.
   b. Sharing bedroom.
   c. Noisy sleeping quarters.
   d. Overheated quarters.
   e. Underheated quarters.
   f. Early glare of light.
8. Insufficient air (50 per cent of children sleep in ill-ventilated rooms).
   a. Sharing room.
   b. Closed windows night and day.
   c. Imperfect breathing habits.

d. Housebound.
e. School windows not open during recess and from Friday until Monday.

9. Insufficient exercise.
   a. Sickness.
   b. Debility.
   c. Underfeeding.
   d. House bound.
   e. Temperament.
10. Suggestionization.
   a. Child won't eat because parents won't.
   b. Saying things before the child.

C. *Incorrect Diet.*

1. Improper diet (children should eat various foods at different ages).
   a. Vegetables at six to eight months.
   b. Cereals at twelve months.
   c. Eggs at fifteen months.
   d. Meat at eighteen months.
2. Insufficient diet.
   a. Mother does not think child requires so much.
   b. Increase of calories at second dentition and period of adolescence.
   c. Poverty.
3. Too rich diet.
   a. Automobile won't run on rich mixture.
   b. Too much candy, cake, ice cream, cream puffs, whipped cream.
4. Incorrectly balanced diet.
   a. Too much starch:
      (Bread, cereal, mush, potato, rice, macaroni, spaghetti, tapioca, cake, beans, hot cakes, waffles.)
   b. Too little protein:
      (Meat, eggs, fish, cottage cheese, gelatin milk.)
   c. Too little fat:
      (Cream, butter, bacon fat and cocoa.)
5. Indigestible diet.
   a. Fried food, meat, potato, egg.
   b. Pork, veal, kidney, greasy stews.
   c. Gravy from grease or drippings.
   d. Fresh bread, cake, pies, fried cakes, rich puddings, nuts.

e. Bananas, berries, cherries (No raw fruit).
f. Corn, cabbage, cucumbers, egg-plant.
g. Prepared cereals (Shredded wheat).
h. Pickles.
i. Condiments.

6. Diet lacking in mineral salts.
   a. Foods high in iron:
      (Spinach, dates, olives, dandelion, greens, lima beans, asparagus, string beans, green peas, lettuce, oatmeal, lentils, meat, fish, eggs, cheese.)
   b. Foods high in phosphorus:
      (Cocoa, wheat-bran bread, pearl barley, oatmeal, wheat, cottage cheese, lentils, dried peas, dried beans, cheese, eggs, fish, meat chicken.)
   c. Foods high in calcium:
      (Cheese, milk, eggs, dried beans, lentils, cottage cheese, oatmeal, celery, cauliflower, spinach, olives, chocolate, cocoa.)
   d. Foods high in chlorine:
      (Cheese, meat, chicken, fish, eggs, milk, cottage cheese, potato, celery, barley, oatmeal.)
7. Diet lacking in vitamines:
   a. Foods high in Fat Soluble A.
      (Butter, cream, cod-liver oil, mutton and beef fat, liver, kidney, heart, fat fish, milk, eggs, wheat, fresh cabbage and lettuce.)
   b. Foods high in Water Soluble B:
      (Liver, heart, brains, sweetbread, fishroe, eggs, wheat, yeast.)
   c. Foods high in Antiscorbutic Factor:
      (Cereals, fresh cabbage, raw rutabaga juice and orange juice, tomatoes, prunes, apples and raspberries.)

II. Incorrect Posture:

A. Relation of Posture to Malnutrition:
   1. Vicious circle.

B. Early Neglect of Child's Posture:
   (In bathing, dressing and general handling of the infant.)

C. Frequency of Bad Posture.

D. Characteristics of a Good Posture:
   (Head up and chin level, chest up, abdomen in, legs

straight, toes forward, with weight on front part of foot.)

E. Incorrect Postures:
(Four types.)

F. Factors Contributing to Faulty Posture:
(Sitting, standing, walking, stair climbing, sleeping, clothing and carrying bundles.)

G. Relation of Posture to Efficiency.

H. Posture, an Expression of Intelligence.

I. Posture in Its Relation to the Body as a Whole.

J. Conditions Secondary to Faulty Posture.

K. Treatment (Prevention, education, exercise, braces).

III. Fatigue:

A. Muscular.

B. Nervous.

IV. Physical Defects:

A. Refractive Error of Eyes.

B. Insufficient Breathing Space in Nose.

C. Enlarged Tonsils and Adenoids.

D. Decayed Teeth, Swollen Gums.

E. Enlarged Glands.

F. Skin Diseases.

G. Structural Defects.

H. Defects of Heart, Lungs, Abdomen.

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CHAPTER III

DIGESTIVE SYSTEM

We have come, in our study, to a consideration of the actual conditions of disease which may affect our normal child, our abnormal child, our well-nourished child and our child suffering from the conditions of malnutrition. We have placed our discussion of diseases in the childhood section not because infants may not suffer from most all of these diseases but because the more protected period of infancy, including as it does much natural immunity to disease, pushes the accident of disease into the years of early childhood.

THE DIGESTIVE SYSTEM

Section I. Dentition

1. Normal Dentition. The proper functioning of the digestive system depends in large measure upon the normal development of the dental arches and teeth. Prenatal care has already proved the fundamental efficacy of effectively securing normal dentition for the future child. Much damage may have been done before the period of early childhood but there is still opportunity for much to be accomplished. The same factors which influence the development of the bony system naturally affect the development of the teeth. Therefore, the composition of the young child's food is very important for normal dentition as the permanent teeth develop just under the temporary teeth. "The importance of providing at this epoch in the life of the child, an uninterrupted state of nutrition which is as nearly the optimal as possible, will serve as the most effective measure in providing for the child, a dental equipment which will last well into old age and protect against the danger of invasion by micro-organisms which now so frequently cause serious infections." (McCollum, E. V., Newer Knowledge of Nutrition. Macmillan, 1922, p. 355.)

A clean mouth at all times is to be striven for by the nurse. Before the teeth are cut, rinsing the mouth with sterile water is important. After the first teeth are present, care of these teeth by brushing and by having early dental supervision will affect

the condition of the permanent teeth. No opportunity should be lost to emphasize with children by the simple story of the relation of good teeth to good health, the necessity of eating suitable foods and the necessity of keeping the mouth and teeth clean. Healthy gums and clean teeth seldom harbor harmful organisms.

2. **Difficult Dentition.** With careful study, many students claim that as high as from 40 to 50 per cent of children are not absolutely normal in their physical development and such children may have some disturbance accompanying the eruption of their teeth.

The common symptoms of difficult dentition are disturbed sleep, loss of appetite, sometimes accompanied by a slight catarrhal stomatitis, slight constipation or diarrhea, slight rise in temperature and stationary weight for a week or two, even loss of weight in some cases, or the infant is constantly putting his hands in his mouth which is perhaps the most common symptom. In delicate and rachitic children these symptoms may be more pronounced and often there is an associated factor, such as bad feeding or a weak digestion.

The treatment is simple but relief is often not immediate. The teeth may have to come entirely through before any or all of the symptoms disappear. If the child's appetite is poor this should be considered an indication of a feeble digestion and the strength and amount of the food should be reduced. The gums should not be lanced unless they are very red, swollen and tense with the teeth just below the mucous membrane. Often it is possible to press or rub the teeth through with a finger covered with sterile gauze.

Dentition, being a condition accepted as a perfectly normal process, has been blamed many times for conditions which are not primarily due to difficult dentition. All sorts of conditions have been allowed to run on for weeks without much attention because the child was teething. Many busy mothers have treated lightly such a condition as diarrhea, because the child was teething but no doctor or nurse, however busy, can afford to blame teething for symptoms which can possibly be laid at any other door. Red, swollen gums will disappear after the eruption of the teeth, but diarrhea may not. One cannot wait for the eruption of the teeth to decide upon the cause of such a symptom. It is safer in caring for acute symptoms occurring simultaneously with dentition, to consider dentition last instead of first in the search for the cause.

3. **Dental Caries.** The seriousness of the problem of dental

caries is indicated by the large percentage of children who, on physical examination, are found to have one or more carious teeth. The Health Service of the New York County Chapter of the American Red Cross has just reported (Examination of Pre-School Age Children, pp. 11 and 12) that 61.8 per cent of 243,416 school children examined in New York in 1920 were found to have carious teeth. The results of the examination of 1,061 pre-school children during the summer of 1922 showed that 72.6 per cent had defective teeth, 25.2 per cent of the children examined having only dental defects. Statistics from other cities are equally discouraging though the development of child welfare work and the present emphasis on oral prophylaxis is undoubtedly reducing the amount of defects found.

Some of the causes of carious teeth are lack of cleanliness, malnutrition, improper food, congenitally defective enamel and in a few cases hereditary syphilis. The theory that the composition of food has much to do with the development of teeth is borne out by the examination of a large number of ancient Indian skulls in which no decayed teeth were found. The type of food consumed not only developed the teeth and jaws normally but acted as a cleansing agent also. The excessive use of sweets, carbohydrates and mushy food and failure to use the toothbrush leads to decomposition of food, fermentation and erosion of the enamel.

Foul breath, gingivitis (sore gums) ulcerative stomatitis, tooth ache and alveolar abscesses are usually related to decayed teeth. A decayed tooth is always a focus of infection which may lead to enlarged cervical lymph nodes and these are often the entrance for tuberculosis. Alveolar abscesses which are common among children with neglected teeth, cause much severe pain and acute swelling, first in the gums and finally in the whole jaw, and a very serious condition may result. No child can be well and happy with decayed teeth in his mouth. We find loss of appetite, anemia and malnutrition following fast upon the heels of "bad teeth," because even a normal appetite subsides if the satisfaction of it brings on a toothache! Where pyorrhea is present, there may be more serious conditions such as swelling of the joints and high temperature which may persist for months or until the teeth have been cleaned and filled.

The treatment of carious teeth must be, first, dental supervision, and the nurse must make parents understand that such supervision does not mean *one* looking over and filling of the teeth. The supervision must be repeated from time to time as often the character of the teeth, such as the softness of the

temporary teeth will cause the fillings to fall out and these must be replaced. Many times dentists are blamed for this falling out of fillings which is not in their power to prevent. Second, cleanliness of the mouth and teeth is essential, and the use of the toothbrush must be part of the daily hygiene. Third, the diet must be provided that will cause the teeth and jaws to develop normally, and avoid erosion of the enamel.

In groups of children where these methods have been carried out, there has been a large reduction in illnesses among the children. If the teeth have been negletced until abscesses have

Fig. 75.—Irregular dentition.

developed, these should of course, be opened and drained. Extraction of the infected teeth may be necessary though this should be avoided if possible in the young child. The most satisfactory type of diet is one which includes extensive use of dairy products and leafy vegetables and not too much meat.

4. **Orthodontia** is a specialty in dentistry which deals primarily with the normal development of the dental arches and teeth. Malocclusion is a variation of the normal relations of the teeth and is usually due to faulty nutrition of the child or to poor dentistry or to bad habits. (Fig. 75.) Premature extraction of the temporary or deciduous teeth causes irregularities in

the development of the permanent set and invariably leads to a retardation of development of the maxillary arch. Malocclusion (Fig. 76) interferes with the normal respiration by pushing the tongue back against the pharynx and thus obstructing the nasal breathing. Often food cannot be properly masticated when teeth are badly irregular. Speech is sometimes affected, clear enunciation being difficult with sharply protruding teeth. It takes time to straighten out these conditions but improvement in the child's facial expression is worth all the time it takes, as the way a child looks is of great importance in his whole development. A few years ago such corrective work was usually postponed until a child was seven years of age because the permanent teeth were

Fig. 76.—Malformation of jaw preventing proper occlusion.

then beginning to supersede the temporary teeth. But experience has proved that the child's jaws are of equal importance in the condition, and treatment must begin early sometimes, eighteen months and two years is not too early to begin to affect the normal development of the jaws thereby giving the permanent teeth a better chance when they erupt, to be in the right relation to each other and to have the proper spacing.

The children have a right to as good teeth as can possibly be secured for them and the nurse must be prepared to give accounts and convincing information on the results from decayed, neglected teeth and the conditions closely related to bad teeth. The attitude that toothaches are part of a child's growing up and

that dental care comes only when a child has reached early adolescence has been proven a grave mistake and the nurse can never overemphasize early care and repeated supervision of a child's teeth.

Section II. Stomatitis

Stomatitis is an inflamed condition of the mouth which manifests itself in various forms according to the lesions present. It is classed as a disease of the digestive system because of the immediate affect it has upon the patient's ability to eat, thereby affecting his nutrition, and because stomatitis is often associated with intestinal conditions of a more serious nature. Stomatitis occurs more often in the crowded sections of cities where infections spread more quickly because of the general lack of cleanliness. A dirty child generally has a dirty mouth inside as well as outside. There are three types of stomatitis commonly seen, catarrhal, herpetic and ulcerative.

1. **Catarrhal Stomatitis** is characterized by redness and swelling of the mucous membrances of the mouth, increased salivation, desquamation of the epithelial cells and occasionally superficial ulcers. It often occurs during an infectious disease, sometimes during teething or as a result of some mechanical injury to the mucous membrane.

2. In **Herpetic Stomatitis** yellowish white isolated spots and superficial ulcers are present at the edge of the tongue and on the inside of the lips. These spots coalesce and may extend all over the mouth even to the pharynx. The symptoms are much like those of catarrhal stomatitis, but is a more painful condition than the catarrhal and does not clear up as easily. In a poorly nourished child the disease manifests itself in a more serious form and is more likely to recur.

3. **Ulcerative Stomatitis** is marked by an ulcerative process at the junction of the teeth and gums, which extends along the gums and occasionally to other parts of the mouth, though it never spreads beyond the mouth cavity. (Fig. 77.) The breath and the saliva which pours out of the mouth are foul. The gums are a purplish red and bleed easily. There is a dirty yellow deposit at the junction of the teeth and in severe cases the teeth may be so loose as to be easily picked out.

Cleanliness is the first principle in the treatment of stomatitis. The mouth may be rinsed out with a solution of peroxide of hydrogen or Dobel's solution. Flushing the mouths of older children with a cold solution has been found to give relief. In severe forms of these conditions equal parts of burnt alum and

bismuth may be dusted on the ulcers and when ulcers are slow in healing silver nitrate stick may be applied directly. (Fig. 78.)

Specific treatment for herpetic stomatitis is chlorate of potash, 2 grains at a dose in water well diluted, i.e., in ½ to 1 ounce of water given every hour, the maximum dosage in 24 hours being 30 grains. After the first 24 hours as improvement occurs, the dose should be given every two hours, three hours, four hours, etc. While good results usually follow this treatment, it must be borne in mind that potassium chlorate is a very active

FIG. 77.—Ulcerative stomatitis.

poison and especially affects the kidney tissues. When giving potassium chlorate the urine should be carefully watched for the appearance of blood. In protracted cases of ulcerative stomatitis more radical treatment may be demanded such as the cleaning up and extracting of abscessed teeth, and the curetting of the ulcers and applying silver nitrate stick.

Thrush is a parasitic form of stomatitis and like ulcerative stomatitis is more frequently found in institutions than in private practice. The fungus consists of small white flakes or larger patches like milk curds which start at the margin of the tongue

and spreads to the inside of the lips, cheeks and may even cover the pharynx. This fungus is reddened at the base and bleeds when removed. It has been known to invade the stomach, intestines and even the circulation but this latter condition is rare. The mouth is dry and the tongue is coated and at times there is difficulty in swallowing. Any slight abrasions to the mucous membranes in a mouth that is not clean are favorable to the development of this parasite (saccharomyses albicans). Some-

FIG. 78.—"Geographical" tongue. (Ordinary "sore" tongue.)

times thrush is associated with such wasting diseases as marasmus, dysentery and tuberculosis; when the patches appear on the tonsils and pharynx it is occasionally mistaken for diphtheria but the history of the patient and microscopical examination of the deposit makes the diagnosis of thrush evident.

The treatment of thrush begins with a very careful, gentle, cleaning of the mouth, avoiding any energetic method that might start fresh infection in the denuded surfaces. Individual sterile

utensils, such as sterile nipples on the bottle, are absolutely necessary in the care of thrush, especially in an institution, as the condition will spread otherwise. The child's mouth should be washed out after each feeding, first with a little sterile water, and then with a weak bicarbonate of soda solution. Where the condition is aggravated by the nipples of the feeding bottle, for example, it may be necessary to resort to gavage for a few days. The application of a 1 per cent solution of formalin or a weak iodine solution has been found to be effective.

5. **Specific Stomatitis.** Three types of specific stomatitis are the gonorrheal, syphilitic and diphtheritic.

The diagnosis of gonorrheal stomatitis depends on the presence of the gonococcus in the exudate. It is rarely found. Yellowish white patches may appear on the tongue and hard palate where the epithelium has been injured by careless cleansing of the infant's mouth. The infant may also have a gonorrheal infection of the eyes. As the infection usually comes from the mother, the importance of asepsis in the handling of the newborn baby is apparent. Treatment is the same as for thrush, boracic acid mouth wash and the patches touched up with a 1 per cent solution of formalin or iodine.

In syphilitic stomatitis the most frequent lesions are fissures in the lips and the angle of the mouth and ulcers and mucous patches on the mucous membrane of the buccal cavity. Treatment is that for syphilis and is discussed in that section.

Diphtheritic stomatitis is present in the mouth cavity in conjunction with infection of the tonsils and pharynx. Antitoxin for diphtheria should clear up this condition.

6. **Gangrenous Stomatitis-Noma** occur in epidemics and we find the greatest number of cases among malnourished atrophic children or among those children who have developed some contagious disease such as measles, pertussis, scarlet fever, etc., in which there is some simple stomatitis due to the disease upon which noma develops. These pitiable cases are usually only seen in large contagious or isolation city hospitals. The mouth is the part most commonly affected but it may be present in the nose, external auditory canal, vulva, prepuce or anus. It is a slow spreading gangrene with no tendency to demarcate or limit itself and from which there is a large amount of foul exudation. A dark greenish black necrotic mass is usually found on the inside of the cheek or on the gums and the surrounding tissues may be so swollen and edematous that the cheek is twice its natural size. As the process extends the teeth may

loosen and fall out and there may be perforation of the cheeks and lips and even sloughing of the face.

Every effort should be made to prevent noma since, if it is not fatal, it is almost certain to leave the patient frightfully disfigured. Frequent and careful rinsing of the mouth as a routine in all infectious diseases will prevent or clear up milder forms of stomatitis which might develop into this fatal form. During the course of noma antiseptic douching of the mouth or area affected is necessary. Excision with cauterization offers the most hope of success if this extends some distance into the healthy tissues. The excision should be done under anaesthetic and Holt recommends cauterizing with Paquelin's cautery to follow this. A second form of treatment suggested is the application of carbolic followed by alcohol after curettement of the necrotic mass. Because of the danger of infection all cases of noma should be strictly isolated. Use of deodorizers such as chloride of lime in the room is important. Potassium permanganate is used. The general treatment of the child is that of keeping him as well nourished as possible, and stimulating from time to time as the drain on the system of the child is very great.

Section III. Gastric and Intestinal Conditions

1. Diseases of the Esophagus. Most of the diseases associated with the esophagus are either congenital malformations or the result of inflammation following the swallowing of foreign bodies or poisons.

Catarrhal esophagitis is less frequently seen than the corrosive form. It is usually caused by lacerations following the swallowing of foreign bodies. If the lacerations are slight, the condition clears up quickly and leaves no ill effects.

Corrosive esophagitis is more common than the catarrhal type and is the result of swallowing caustic alkalis or strong acids. The condition may be either superficial or deep, according to the amount or the irritant which has been swallowed. The treatment should be aimed to neutralize the caustic and to prevent deep action to the tissues. Oils and demulcent drinks have a healing effect and ice may be given for relief. If there is a good deal of pain, morphin can be given. If the poison has produced stricture, surgical treatment is necessary.

The only method of ascertaining that an article has been swallowed and where it is lodged is by means of the X-ray.

Surgical treatment should not be considered unless there are definite localizing symptoms which call for immediate relief.

Watchful waiting and a diet which will cover the article swallowed with a gelatinous coating is the best type of treatment. Such a diet should consist of bread, coarse cereals, and vegetables. Cathartics and emetics should not be given.

Neuropathic children sometimes form the habit of eating hair, shreds from clothing or blankets, and like substances. Usually this is passed through the intestines or vomited without trouble. The formation of a "hair ball" may cause an intestinal obstruction which will make more radical measures necessary. Hair balls have been found that filled the stomach and weighed several pounds and were mistaken for tumors. Cathartics may remove such masses, but, if ineffective, the child is in pain and an operation is necessary.

2. **Acute gastro-intestinal indigestion** during childhood is usually the result of improper feeding, contaminated food, and, in certain sections of the country, to summer heat.

The condition is generally ushered in with some temperature, with vomiting and mild pain followed by diarrhea. The stools are loose and contain particles of undigested food and may be almost any color. In the more severe forms, as the result of the neglect of a mild condition, the pain is more intense and a skin eruption—urticaria—may be present. The child will have a coated tongue and no appetite. These symptoms are common to most indigestions and neither a doctor nor nurse are usually called.

Treatment should be directed to cleansing the intestinal tract with a dose of castor oil which often straightens out the ordinary case in a healthy, robust child. In delicate children, however, innumerable histories show such mild repeated attacks as the starting point for many of our chronic cases of indigestion and difficult cases of malnutrition. Food should be discontinued until the vomiting has ceased. Older children can drink large quantities of boiled water, which serves to cleanse the stomach when vomited. Castor oil, followed by a saline purgative, may be given if the diarrhea is not profuse and there is certainty that the attack is due to food. This should be followed by colon irrigations which not only hasten the action of the cathartic but act as cleansing agents. Such irrigations may be made up of 1 tablespoonful of salt to 2 quarts of water, about 100° F. temperature. Irrigations may be given several times the first day, later once a day is sufficient. The first food given the child should be broths and thin gruels, buttermilk, kumyss, and protein may be added later. Junket, from which the whey has been removed, will often check the diarrhea. Usually these conditions clear up in a few days if properly treated.

These are general principles which cover the treatment of most simple indigestions. Attention to the hygiene and feeding of children particularly during the summer months would unquestionably cut down the number who suffer from these conditions. Vacation homes for children from the crowded sections of our large cities have had a definite effect. Fresh air and plain food, even for only two weeks, may build up the resistance of a child and make it possible for the child to go through the balance of the summer without serious upset.

The more serious forms of intestinal indigestion are those associated with intolerance for special elements in the food the child should eat. Upsets may be the result of an intolerance with which the child is born, a badly balanced diet or the result of an acute infection.

5. **Fat indigestion** is a common form of indigestion during childhood. It may be due to one of the causes just cited and result in an inability to digest fat for a long period. The diagnosis depends on the excessive amount of fat found in the stools when the child is on a diet containing only a normal, or less than normal, amount of fat in the diet. The child appears either very pale or has too much color, is peevish, has no appetite or a finicky one, the breath is foul, the temperature varies, the abdomen is large, the stools are frequently oily and pale, showing, if placed on paper, the characteristic oil stain, there is stationary or failing weight over a long period.

Treatment for fat indigestion must be aimed to rest the fat-digesting function of the child. The nurse must constantly supervise the food eaten to see that almost no fats are contained in it until the stools begin once more to be normal. This demands of the nurse accurate knowledge of the food containing fat, and great care and patience in getting the child to eat the fat-free diet. During this period carbohydrates must furnish the food elements the child needs. The length of time the child should be deprived of fat depends on the general condition of the child and the appearance of fat in the stools. If fat indigestion is allowed to continue over a long period the child reaches the stage of a definite malnutrition in which he is the prey of every infection which comes his way.

In tuberculosis of the abdomen and mesenteric glands, fat digestion is interfered with, and this must be considered in studying any case of fat indigestion.

6. **Carbohydrate indigestion** may be present in several forms. In the mildest, either sugar or starch may be at fault without fermentation. The more common form, however, is that associated with fermentation. Less frequent types are those in

which carbohydrate indigestion has given rise to a special organism, gas bacillus, for example, or to an organism associated with the production of butyric acid.

The picture is practically the same for all these types of carbohydrate indigestion. The child is underweight, has a poor color, pigmented skin and a "pot belly" full of gas. The stools are large, spongy, often loose and foamy, sometimes containing bits of mucus and usually much starch. The iodine test under the microscope easily shows the starch granules made blue in color. These conditions are ordinarily the result of faulty food habits, such as too much starchy food, poorly cooked food, or, at times, a particular starch food which the child cannot tolerate.

Treatment to be effective must include the reduction or elimination of the special food which seems to be at fault. Careful cooking and chewing aid digestion, but neither process eliminates starch if it is present. Where the condition is a fermentative one, increased amounts of proteins which favor the growth of bacteria antagonistic to fermentative organisms may be given. Lactic acid milk is usually well borne. When the child is able to return to solid food he may be put on a diet practically starch free, with such fresh vegetables as spinach, asparagus tips, carrots, peas, etc. If the child tolerates this diet, starches may be added gradually, such as a small amount of rice and thin dry toast, until the child is once more on a normal diet.

Emphasis should be placed on the way food is cooked, the condition of the child's teeth, and the manner of using the teeth. It is important that the child have properly cooked food and that he chews it. These conditions are very discouraging to the mother, but she should be warned of the results which are likely to attend failure to adhere to the directions given by the physician. The picture given above is that of a malnourished child, and, if the condition is not effectively cleared up, recurrences will be frequent and increasingly more serious.

7. **Protein indigestion** is a condition seldom seen, though certain types of indigestion are often called protein owing to the presence of tough curds in the stools. Milk curds, we know, are produced in the stomach and are more likely to be the sign of improper preparation of the milk. The curds, acting as foreign bodies, may cause some disturbance. It must be remembered that no one can live on a protein free diet for any length of time and the more delicate the child, the more is this true, as such a child has little or no protein reserves. In older children, certain proteins cause an anaphylactic reaction which shows itself, with certain foods, in intestinal disturbances, such as vomiting, diarrhea and abdominal pain. The usual symptoms,

however, of protein sensitization are skin manifestations, urticaria, eczema, or respiratory conditions such as asthma. Where protein is at fault, the total quantity must be reduced and the kind of protein changed. To get the child's protein tolerance stabilized again, the individual may be immunized by injecting subcutaneously the protein at fault, or by feeding the same protein in very small doses and increasing the dosage as the individual's tolerance increases. This procedure is not always satisfactory and is often tedious and difficult.

Protein indigestion may occur when too much protein has been fed or when a putrefactive condition develops in the intestinal tract. In such cases, the treatment is to clear out the intestinal tract with castor oil or some milder cathartic depending on circumstances, and to irrigate the bowels. Cathartics and irrigations are not indicated when there is profuse diarrhea, as that is in itself a cleansing action. The point in treatment of this condition is to cut out the offending food. Plain water for twenty-four hours will insure a clean intestinal tract. The stools are usually brownish in color, alkaline in reaction and very foul.

8. **Dysentery and Infectious Diarrhea.** Dysentery affects children of all ages and is likely to be much more prevalent during the summer months than during the rest of the year. It is usually caused by a specific organism, one of the dysentery group of organisms, though other organisms such as the streptococci may cause the condition. The condition commences with vomiting and diarrhea. The stools are frequent, very small, sometimes foul and musty, watery at first and then contain mucus, pus and blood. The child may suffer intense abdominal pain preceding the stool and there may be prolapsus ani which may be very troublesome and persistent, though found more often in chronic cases and after the acute symptoms are gone and convalescence has begun. The temperature is often very high; the mouth is dry and parched owing to the great loss of water. The acute symptoms usually persist only a week or two but convalescence is very slow and the child may not return to normal weight for many months. In the more severe types of dysentery such as the severe catarrhal and membranous forms, the symptoms are more obscure and the prognosis is usually bad.

The treatment may be divided into specific and symptomatic. Specific treatment consists of giving the specific serum of the organism causing the infection. Opinions of serum treatment vary widely but in certain cases, I have found the use of dysentery sera to have very rapid and effective results. Before the use of any serum the stools must be cultured and the type of organism determined.

In the majority of cases, the symptomatic treatment is relied upon. As the main symptoms are frequent stools and loss of water, the important thing to do is to replace this water. If water cannot be taken by mouth because of vomiting, it must be given by one of the three other routes, subcutaneous, interperitoneal and intravenous. Giving fluid by rectum as by the Murphy Drip does not succeed. Irrigations or flushing used to be used a great deal and are still used by some physicians but the general consensus of opinion is that they do little or no good unless it is to relieve the distention (see Harmer, p. 118).

The food which the child will take will depend, of course, on the type of infection, the size of the child, and many other factors. In the presence of a proteolytic bacteria, to which group the dysentery bacteria belong, a sugar or starch diet tends to cut down their toxicity, but too high a sugar diet may at the same time increase the intestinal irritation and number of stools, though this does not always follow. If the treatment is directed mainly at the cutting down of the number of stools, a high protein diet will do it. Protein milk, fat-free buttermilk, or plain boiled skim milk will all do this. The sugar or starch may be added in the form of fruit juices or sweetened water. In this way, a fine balance may be worked out between the protein and the sugar in the diet. Stimulants are seldom indicated except as an extreme measure, when the rapidly acting ones are preferred, such as camphor, aromatic spirits of ammonia, whiskey or brandy.

However, this is not the type of diarrhea in which the medication is directed toward cutting down the number of stools with bismuth or paregoric, although in the late chronic stages after the infection has disappeared, the diarrhea may be checked by these drugs. Too early checking must be avoided, for if the infection still remains, checking the diarrhea will leave the infection in the intestinal tract, and the chances for an acute recurrence of the infection are great. The dietary and general hygienic treatment of these cases often extends over months and demands careful supervision. In our large cities, many cases of malnutrition among infants and young children occurring during the winter are the effect of these diarrheal conditions of the previous summer and early fall.

1. Chronic gastro-intestinal indigestion is a condition which the nurse is likely to meet very frequently. Children between the ages of one and five years are more prone to this complaint, though it is often seen in older children. Occasionally children in whom no great error in hygiene and diet may be found are affected. More often congenitally delicate infants, those who

have been on too high a fat mixture, or infants given solid food too early, develop this malady. A long and difficult dysentery or infectious diarrhea may result in a chronic intestinal indigestion. The fault usually lies in an inability to digest certain common articles of diet, such as improperly cooked vegetables, especially potatoes and cereals.

Chronic gastro-intestinal indigestion is amenable to proper treatment, but if neglected may result in dire consequences for the child. Coeliac disease and infantilism are extreme forms of this disease, and where the condition is persistent it usually results in retardation of physical development.

The picture is one of aggravated malnutrition. The child is usually thin, with small extremities and large protuberant abdomen. He looks pale and haggard, may have dark rings under his eyes, and is easily fatigued and very irritable. Although much below normal weight and even quite markedly retarded in growth, mentally these children are often precocious. The hands and feet are apt to be flabby and cold, the child perspires overfreely at night, sleep is restless and disturbed, and the child will wake crying and peevish.

Constipation followed by diarrhea is the usual sequence. The movements are pale and pasty, sometimes clay-colored and often have a foul odor. When diarrhea is present an abnormal amount of mucus and undigested particles of food are usually found. The stools become greenish or brownish and are quite acid. When the condition is due to too high fat mixture there is an excessive amount of fat present in the stools.

The appetite is variable; at times the child is ravenous and at other times food must be forced. A low-grade temperature may be present for weeks. The amount of urine excreted increases with the increase of nervous symptoms, and indican is usually present. These children show marked fluctuation in weight, due either to water loss or water retention.

The prognosis depends on the length of time the child has been sick, on his general condition when brought to the physician, and on the co-operation of the child and parents. Recovery is slow at best, exacerbations are frequent, and parents become discouraged at the chronicity of the condition.

If treatment can be started early and is conscientiously carried out, severe forms of chronic intestinal indigestion may be avoided. The essential elements of treatment are diet and regimen. The intestines must be given a rest and certainly freed from the articles in the diet which have apparently brought on the condition. Directions as to diet should be carefully written out, both as to kinds and amounts of food, as well as to methods

of preparation and hours of feeding. Nothing should be left to chance until the child is once more on a normal diet. It is well for the mother or nurse to keep a very accurate record of what the child eats, as well as the number and character of the stools, as this is helpful in avoiding recurrences of the condition.

The diet at first must be mainly one of high protein foods and practically no fats or starches. Chicken or veal broth from which the fat has been removed, buttermilk, kumyss, protein milk, cottage cheese, under-done beef, chicken and fish are tolerated, though there is likely to be no gain in weight on such a diet. Plenty of water should always be given. Fats must be added very cautiously as the digestion improves, and finally starches in small amounts, stale bread first and then strained green vegetables. The digestive ability of these children must regulate the amounts of food given, but it is not wise to restrict the child's food too long and too severely, as his digestion must be trained to manage the food which has given him his trouble.

The diet should regulate the constipation, but if not, mild laxatives such as cascara, rhubarb and salines are usually efficacious. The bowels must be kept well emptied because of the abdominal distention. General tonics such as nux vomica combined with a preparation of iron, are sometimes of benefit during convalescence.

The regimen which accompanies the diet brings the best results. Often a complete change of air and scene will work wonders. A careful regulation of the child's activities, and rest periods before and after meals and a mid-afternoon nap, assists in the digestion of the food. I have found physio-therapy beneficial in stimulating the muscle tone. Sun treatments have been tried and when carefully regulated have been an important factor for their tonic effect as well as a method of increasing the rest periods of an over-active child. When the condition permits, a cool water sponge in the morning is advisable. As these children are subject to rapid changes of temperature the proper regulation of their clothing during the day and of the bedding at night is important. If desired their clothing may include a simple abdominal support. This gives the patient comfort and to some degree prevents the excessive distention of the abdomen.

The family must be made to realize that chronic intestinal indigestion may be a matter of years and successful treatment is in their hands. The physician can only advise as to the diet and regimen and by conscientious attention to his directions they can themselves cure the child.

2. **Chronic Constipation** is a condition which we see all too frequently. As the physician and nurse meet it, constipation

is usually associated with some other ailment, as one of the symptoms. However, as an entity, chronic constipation is a very important factor in the child's physical development and often is a predisposing one to some other more serious condition. Because the nurse has opportunities of pointing out to mothers the seriousness of this condition and methods of correcting it I have treated it rather extensively.

Constipation is a condition in which the bowel movements are less frequent and firmer than normal (stools are small, dry and hard) or are entirely absent without artificial stimulus. In rare instances, constipation may be the result of an anatomical peculiarity but generally it is due to defective training, habitual faulty diet, general muscular atony or mental inertia. If the child has had rickets, his muscular walls may have become unable to do their work. Constipation is often the natural sequence of a diarrheal disease and is just as often aggravated by the indiscriminate use of purgatives and enemata. Malnutrition predisposes to constipation. The mechanical explanation of constipation is that the secretion of the intestinal glands or the liver is diminished and there is insufficient muscular contraction in the intestine to send the fecal mass along. The mass, therefore, remains in the intestine so long that the fluid portion is absorbed and it is almost impossible to expel the dry, hard residue by natural means. During the second and third year, the child's diet may contain so little solid food that no residue is left for the intestine to work on or there may be an excessive amount of starch. This latter fault is particularly true of older children's diet which is likely to be made up of too starchy food and an insufficient amount of green vegetables, coarse cereals, meat, fruit and water. Loss of muscle tone may also be the result of too little muscular exercise. Flatulence and colicky pains are usually an accompaniment of constipation and the irritation caused by the hardened fecal masses may produce a slight catarrhal inflammation of the sigmoid flexure and the rectum so that mucus and traces of blood are sometimes passed with the stool. Hemorrhoids are occasionally the result of constipation and may even develop during infancy, and the straining associated with the constipated movement has been known to produce hernia.

Treatment: Eradication of constipation depends much more on the training the mother or nurse gives the child than on the advice of the physician if a careful examination has proved that no malformation nor recent bowel disorder is responsible for the condition. As has been emphasized in the discussion of "The

Hygiene of Infancy" even an infant can be trained very early to have regular bowel movement (see Hammer, pp. 117–118).

When constipation is present in an older child, careful study and regulation of his daily regimen is necessary. Habit is a prime factor in the treatment of most cases of constipation. The child should go to the toilet regularly at the same hour every day and he must be taught to heed the first impulse to evacuate the bowel. Immediately after breakfast is the preferable time because the taking of food starts a peristaltic wave. Breakfast should be at such an hour that the child has sufficient time for this duty before it is time to start to school. The posture of the child on the toilet is a point which is often neglected. The seat should be neither too large nor too small and if it is too high a stool should be put under his feet. He should be able to sit on the toilet in such a position that he can lean forward with his body at an acute angle without loss of balance.

It is important that the mental attitude of the child should be right. "Mental atony," as Doctor Thomson (John Thomson: Clinical Study and Treatment of Sick Children, p. 251) calls it, may have a good deal to do with getting proper results. There are ways of interesting a child in the successful results of this duty without dwelling on the matter. Every child is interested in how an engine works and this figure may be successfully used to teach the lesson.

The diet is an important element in the treatment of constipation. During the second year, constipation may be benefited by increasing the solids. Bran and coarser cereals, thoroughly cooked purees of green vegetables and fruit juices, stimulate regular movements. Meat broths and beef juice are somewhat laxative because of their extractives and salts. Raw fruits should be given cautiously during the first three years of life.

The diet of the older child should be limited as to starches, coarse cereals should be given and all bread should be made of whole wheat or unbolted flour. Bran muffins have been found beneficial. Care should be exercised in giving these foods, however, as they have been known to defeat their own ends. They may move the bowels but at the same time aggravate some other condition, intestinal indigestion for example. Fruit, raw or cooked, green vegetables and vegetable salads, together with meat and broth, may be freely given. Most children like honey and molasses and these may be allowed on bread or used in cooking to advantage. It is a good thing to give the child a cup of water (hot or cold) or diluted fruit juice as soon as he awakens, an hour before breakfast is best.

As an accompaniment of the regulation of diet, abdominal

massage properly employed for about five or ten minutes before rising and after retiring assists in conquering the condition. The child should also have some general muscular exercise as the Daily Dozen setting up exercises, as well as special exercise for the abdominal muscles.

A stubborn case may need mechanical aid at first and an oiled glass rod or gluten suppository may be used to start the movement, but the child should not be allowed to depend on this. Neither should enemata be resorted to regularly, though they are often necessary for immediate relief. Sometimes the injection of one or two ounces of olive oil every night will facilitate the passage of hard dry stools and break up the constipation habit.

Medical treatment is the least important as well as the least effective. While laxatives may be necessary for obstinate cases of constipation, they should be used as little as possible and doses should be given in diminishing amounts. Mothers should be warned that castor oil does more to produce constipation than to relieve it. Pure mineral oil, Russian oil or petrolatum are good to use because their action is purely mechanical and not at all griping. The laxatives used are cascara, rhubarb, nux vomica, belladonna, phenolphthalein and some of the purgative salts, but they will only relieve the condition temporarily, never effect a cure. Malt preparations possess laxative properties and malt and oil is effective with older children as a tonic; also bran grits and Roman meal. Agar-agar combined with some other laxative or broken up and mixed in cereal softens the fecal mass and makes expulsion easier.

It should be emphasized that to clear up a case of chronic constipation it is necessary, first, to rule out possible anatomical or physical reasons for the condition. Only a careful examination by a physician together with X-rays can give the mother this assurance. Second, if constipation is the one abnormal condition found on examination, then the diet and hygiene must be at fault. These must be regulated to give the child's organs every opportunity to perform their functions normally. Third, recourse is to be had to artificial stimuli—suppositories, enemata and medicine—only as a last resort after diet and hygiene have been conscientiously tried and then only to an ever diminishing degree hand in hand with diet and hygiene.

Hirschsprung's Disease (Hypertrophy and Dilatation of the Colon). Hirschsprung's Disease is a condition which is usually limited to early infancy though it is not entirely unknown in older children. This condition is characterized by a great increase in the size of the colon and the thickness of its wall, the dilatation and hypertrophy being greatest in the sigmoid region.

Obstinate constipation and distention of the abdomen, from gas and an accumulation of fecal matter, are present. An aggravated case of Hirschsprung's Disease rarely recovers. It usually becomes gradually worse, nutrition fails, there may be attacks of diarrhea with fever or the patient may die from an intercurrent infection. Operative measures have so far proved unsuccessful. In milder cases where there has been careful feeding with constant emptying of the colon, these children have been known to live to adult life. The growth of the body tends to straighten out the colon which would favor a certain degree of recovery.

Section IV. Acute Duodenal Indigestion or Catarrhal Jaundice

1. Acute duodenal indigestion or catarrhal jaundice is a relatively common disease in older children. It is not infrequently seen between the ages of 3 and 6 years. It is sometimes a complication of some other condition like otitis media or occasionally as a complication of some infectious disease such as diphtheria, or it may occur with malarial fever, or it may appear insidiously following a dietetic indiscretion of fats and sugar, after a children's party.

In the majority of cases the onset is sudden with fever, vomiting, pain in the stomach which will last a day or two and be followed by jaundice, clay colored stools and bile in the urine. The child's tongue is thickly coated and he has no appetite. Sometimes there is much flatulence and the liver tender to pressure (Fig. 79). Where there is complete obstruction of the bile, the stools usually show an excess of fats in the form of soaps, but when there is diarrhea, fatty acids and soaps are both found. Complete obstruction of the common bile duct results in the drawing back into the circulation of bile in the form of bilirubin, which colors the tissues and partially overflows into the urine. Fat in the food is only slightly digested. Where diarrhea is the result of prolonged irritation of the intestinal mucus membrane, due to stagnation and decomposition of fat, a secondary intestinal indigestion usually complicates the duodenal or jaundice indigestion.

Treatment must be the complete elimination of fats and sugars from the diet. If there is excessive vomiting, food may be discontinued, for a short time, and then begun again with skim milk diluted with lime water. The child will usually tolerate proteins, especially meat, fat free milk and easily digested starches which have been thoroughly cooked. Fruit may be well taken. The poor appetite may be stimulated with

FIG. 79.—A congenitally enlarged liver outlined.

nux vomica. Large doses of alkalis (bicarbonate of soda or alkaline mineral waters) are usually effective in pushing out the mucus plug in the bile duct, and should be given freely. The bowels must be kept open and the child should be on the restricted diet for at least a week after the jaundice has disappeared. Severe pain, when present may be relieved by counter-irritation of mustard or turpentine for example.

The prognosis is always good and the condition usually clears up in about two weeks and recurrences are infrequent.

2. **Cyclic (recurrent or periodic) vomiting** is an ailment not infrequently seen during early childhood. The origin of the condition is obscure but it is evidently due to faulty metabolism associated with an acidosis. It derives its name from recurrent or periodic attacks of vomiting which occur at regular or irregular intervals, usually not oftener than every two weeks and occasionally only twice a year. Girls seem more prone to this ailment than boys.

Cyclic vomiting is seldom seen except in private practice and delicate and highstrung children are more likely to be affected. Usually these children belong to families which are neurotic. Thomson (Clinical Study and Treatment of Sick Children, p. 458) has seen it in several of his cases who have given a history of having had asthma, urticaria, eczema or stammering. Except in very young children, cyclic vomiting is seldom dangerous. The attacks appear without adequate cause, apparently, last two or three days, during which time efforts to control the vomiting are unsuccessful, and finally the attacks cease spontaneously.

Cyclic vomiting attacks are usually not traceable to dietary indiscretions. The exciting cause is usually a nervous one. Fatigue, unusual excitement (a children's party or a railroad journey), chill, a feverish illness (tonsilitis, influenza, etc.) or an anesthetic (for tonsillectomy) may produce an attack.

The onset of cyclic vomiting is typical in most of the cases. During the twelve or twenty-four hours preceding the vomiting, the child appears pale and languid and has dark circles under the eyes. She may have a headache, anorexia and be constantly yawning. For several days the child may have white stools or, on the other hand, may be constipated. There is an excess of indican in the urine, which may even persist between attacks, which is a very important symptom. The vomiting starts suddenly and for two or three days, sometimes a week, the child will be unable to keep anything down, even vomiting small quantities of water. The temperature is seldom high during these attacks but the child becomes exhausted, sometimes comatose. The

abdomen is flat and retracted. The pulse is soft and rapid, the respirations shallow, both pulse and respirations being irregular at times. During an attack, vomiting occurs on the slightest provocation such as merely turning the patient in bed or speaking to him unexpectedly. At first the vomitus consists of food, mucus and bile, later a thin clear, watery fluid, and occasionally only blood may be present.

First attacks, if severe, have been mistaken for meningitis, acute gastric catarrh or intussusception, but these diseases are excluded by the history and symptoms. The prognosis is generally good. Because of the possibility of acid intoxication, these children should have very careful treatment. Usually the attacks diminish in frequency and severity as the child grows older and stronger. By the time the child reaches puberty, they have ceased entirely, often to be superseded by migraine, as there seems to be a relationship between this condition and recurrent vomiting. Migraine often appears in the family history as well as being one of the symptoms of an impending attack.

Treatment at the onset of the condition should consist of starvation and purgation. Milk of magnesia is very effective given in small quantities with shaved ice one teaspoonful to a tablespoonful of shaved ice every twenty minutes until ten to fifteen teaspoonfuls have been given). The child should be kept as quiet as possible which is not difficult since the child has no inclination to activity. A bicarbonate of soda solution (twenty to thirty grains to five or six ounces of water) given four or five times a day keeps up the urinary secretion and lessens the thirst and restlessness. Urine should be examined often and immediately after voiding in order to direct the steps in treatment. In severe cases, 6 or 8 ounces of a 5 per cent glucose solution may be given once or twice a day per rectum or by the Murphy drip method (see Harmer, pp. 525–529). If acidosis develops and saline solution per rectum has not been effective in changing the urine to alkaline then a 4 per cent soda solution, 150 to 200 c.c., should be given intravenously.

After vomiting has ceased the child may have small quantities of food, broth, thin cereal, whey, iced milk and lime water. Thin toast with a little currant jelly has been well tolerated. The regimen of a child subject to recurrent attacks of vomiting should be such as to exclude fatigue and excitement and to include plenty of sleep, rest before meals, fresh air and regular bowel movements. Porter (Management of the Sick Infant, p. 31) suggests for the prevention of these attacks a daily ration of one and one-half pints of a high calorie orangeade instead of milk, well cooked fine cereals and other forms of

easily cooked carbohydrates, fruits and limited amounts of meat. How frequently the child has these attacks and how soon they will cease entirely depend very largely on the strict adherence to a normal diet and regimen.

Section V. Intussusception

Intussusception is the invagination of one section of the intestine into another—telescoping—and may involve any point in the intestinal tract. Intussusception is responsible for the majority of the cases of intestinal obstruction during infancy. Most of these cases occur during the first two years of life. The healthy child usually suffers the attack. The onset will be characterized by a sharp cry of pain and then a partial collapse followed by perhaps several hours of apparently normal periods. Then another attack of pain comes on which vomiting and passage of stools. The vomitus at first is the stomach contents and later bile. The stools are fecal in the beginning and then contain blood and finally blood and mucus. During the periods of collapse, the pulse is feeble and the condition is one of apathy. Usually a firm sausage shaped tumor can be felt on careful palpation. It may be situated anywhere in the abdomen depending upon how far the invaginated section of the bowel has moved.

Delay is fatal in intussusception and within twenty-four hours a careful examination, under anesthetic if necessary, should be made. Laparotomy offers the best hope of success but it can only be successful if done early. Within thirty-six hours of the onset of intussusception, paralysis of the bowel and gangrene may have set in and it is then too late for operation. Rarely complete reduction occurs spontaneously. Distention of the bowel by water and air has been tried successfully in a very few cases also.

Section VI. Appendicitis

Appendicitis is a disease which is met throughout life though less frequently during infancy than in later childhood. Among children symptoms do not differ in any important respect from those in adults. The cause of appendicitis is not definitely known. Foreign bodies are found in only a small number of the cases and the bacteria usually found in the abscesses of appendicitis are streptococci generally associated with the colon bacilli.

Appendicitis is usually ushered in with vomiting, severe ab-

dominal pain and tenderness on pressure. Muscular rigidity, abdominal distention and fever when present assist in the diagnosis. The symptoms of appendicitis are often mistaken for those of colic indigestion and intussusception in infants. Cyclic vomiting may simulate recurring attacks due to a chronic appendicitis. The symptoms are not unlike those of certain acute infections such as typhoid and acute pleuro-pneumonia of the right base, which give rise to abdominal pain and tenderness. Whenever symptoms point to a peritonitis, appendicitis should be suspected.

The prognosis in very young children is not good because of the difficulties of early diagnosis and consequent delay in operation. General peritonitis, which is the usual cause of death, is more frequently seen in children, though they usually make better recoveries with this complication after operation than do adults.

Treatment should consist of absolute rest in bed and ice bag to allay pain. Opiates for the pain are likely to mask the symptoms and for this reason are to be avoided. Purgatives are also contraindicated because of the risk of perforation. The colon should be kept empty by enemata and only liquid food should be given. Because of the danger from peritonitis and rupture especially in younger children, surgical advice should be sought as early as possible and operation should not be delayed after the diagnosis is made.

Section VII. Acute Peritonitis

1. Acute peritonitis is a condition in which the peritoneum lining the abdominal wall and covering the adjacent intestines and solid viscera is covered by patches of yellowish-gray fibrin which causes adhesions between the various viscera and often matting together of the intestines. Serum, fibrin and pus are the products of this condition especially in the purulent form. Peritonitis may occur at any period of childhood. It is more commonly a secondary condition than a primary one, most frequently appearing with appendicitis. It may also be due to a direct infection through the umbilical vessels, traumatism, a surgical operation on the abdomen, and may follow severe burns.

Peritonitis appears abruptly with fever and vomiting of greenish material. The abdomen is swollen and tympanitic, pain may be localized or general, with tenderness on pressure and usually marked rigidity of the abdominal walls. There is great prostra-

tion and infants may have convulsions. A polymorphonuclear leucocytosis is usually present though it has been lacking in some of the gravest cases.

Prognosis is always grave, particularly in early infancy. In most severe forms the course is short and intense, and death occurs between the fourth and sixth day.

Medical treatment must be associated with surgical. An early exploratory operation offers the best chance of recovery if the condition of the child will permit this. Opium may be given for relief of pain and turpentine stupes may relieve tympanitis. If peritonitis is suspected purgatives should be avoided.

2. **Chronic (non-tuberculosus) peritonitis** is more frequent in children over six years of age although it has even been known to be present in the fetus, and may occur at any age. It usually follows the acute form or it may be associated with a disease of any of the organs which are covered by the peritoneum. It is very difficult to differentiate chronic and tuberculous peritonitis.

Treatment differs little from that of the acute form. The child should be kept in bed. If fluid is not absorbed it may be removed by paracenteis. Laparotomy usually gives good results. Where there is no tendency to absorption of fluid the patient usually dies from exhaustion or some intercurrent disease.

Tuberculous Peritonitis is discussed in the chapter on Tuberculosis.

Section VIII. Diseases of the Rectum

1. Prolapse of the rectum (Fig. 80) is usually found in children who have lost weight rapidly due to some gastro-intestinal infection by which the support of the rectum has given away. A second cause is severe and prolonged straining, the result of constipation, pin worms or from a diarrhea associated with catarrh of the rectum. When the prolapse is slight in degree and only occurs during defecation it may be easily returned. In severe forms of prolapse any exertion, crying and coughing as well as defecation, may bring it on. The appearance of the tumor varies with its size. In the mild form it is simply a ring composed of a fold of mucous membrane surrounding the anus. The tumor is flattened and corrugated in the severe form and is usually the size of a small tomato, the mucous membrane covering it being a deep purplish-red color which bleeds easily.

Small tumors can be reduced by gentle pressure with oiled fingers or with an oiled rag. Application of cold, ice or cold cloths or even an ice water enemata assist in the reduction.

The child must rest in bed, lying on his back, for at least an hour after reduction. If the prolapse is severe the bowels should be moved with the child lying on his back and during defecation the buttocks should be pressed together by the nurse or the child placed in such a position that no strain is necessary. An adhesive strap two or three inches wide placed tightly across the buttocks is often effective. In severe cases suppositories of cocaine (¼ to ½ grain) have been found more effective than those of opium or belladonna. Where the prolapse is of long standing, painting the part with a solution of epinephrin, then dilating the sphincter by passing the finger into the central opening

Fig. 80.—Prolapse of the rectum.

of the tumor, has been successful in reducing the prolapse. Diet and hygiene are important in this condition because as the child becomes fat and his muscles firm it will be overcome.

2. **Fissure of the anus** is not an uncommon ailment in children. It may be due to the passage of large hard fecal masses, to lesions of the skin and mucous membrane (eczema for example) or it may be the result of irritation due to diarrhea or pin worms. The habitual use of suppositories and enemata is very apt to cause a fissure.

If the tear is only a simple one, it will usually heal quickly but repeated tears are likely to produce linear ulcers or a true fissure. In their turn fissures of the anus cause constipation

as the child will often inhibit a bowel movement rather than suffer the pain which accompanies defecation. Prophylaxis is very important in the treatment of fissure of the anus. The first object to be aimed at is the removal of the constipation by diet, massage and mildly laxative medicines. Injections and suppositories should be avoided. The parts around the anus must be kept clean and an ointment used externally and also gently inserted on a cotton pledget. An ointment made up of a drachm each of ichthyol and tannic acid to an ounce of vaseline has been found useful. Touching the anus with a solid stick of nitrate of silver has also been found effective. In severe cases the sphincter may be stretched under anesthetic by the introduction of two fingers. The utmost cleanliness must be exercised in all these procedures.

FIG. 81.—Showing head of tapeworm. Note the four large suckers by which the tapeworm gets his hold on the intestinal mucosa. (From the National Pathological and Anatomical Museum, University Institutes, Wien.)

3. **Hemorrhoids** are not often seen in children but when present they are usually due to chronic constipation. The tumors are generally small and external and the child complains of pain on defecation, which is occasionally accompanied by bleeding. Unless the condition is neglected an operation is rarely necessary. Measures should be taken to clear up the constipation and if the child is put on a rational diet and regimen the hemorrhoids will disappear.

Section IX. Parasitic Infections

Parasitic infections are not uncommon during childhood though they are very infrequently seen in private practice.

Fig. 82.—Picture of the tapeworm. The head is at the small end and two of the suckers can be seen as fine black dots. (From the National Pathological and Anatomical Museum, University Institutes, Wien.)

Fig. 83.—Picture of the roundworm. (From the National Pathological and Anatomical Museum, University Institutes, Wien.)

Fig. 84.—Picture of pinworms packed in intestinal lumen. (From the National Pathological and Anatomical Museum, University Institutes, Wien.)

A generation ago the view was largely held that intestinal worms were at the bottom of most children's diseases; now they are seldom considered. Certain types of intestinal worms are as common to this country as to Europe, though Holt believes that the northern part of the United States is less troubled than Europe. The most common types are the tapeworm (Figs. 81–82), (cestodes) roundworms (Fig. 83), (nematodes) pinworms or threadworms (Fig. 84), (oxyuris vermicularis) and the hookworm (usually called the uncinaria Americana). This last type is more common to the Gulf States and South America than to other parts of North America. The ameboid infections and flagellates, microscopical parasites, are seen frequently on the Western Coast of the United States, apparently acquired in the tropics and the Orient, where sanitary standards are more lax than in this country.

DeBuys (Am. J. Dis. Ch. 18:269, Oct., '19) made an interesting study of stools in children in seven institutions. The stools of 595 children were examined and of these 317 (53.27 per cent) were infected with either one or several types of intestinal worms. Males were infected 13 per cent more frequently than females. He found that there was a higher incidence in institutions where there was no regular medical inspection. DeBuys felt that hygiene, general care, duration of residence in the institution, previous environment, association with dogs, eating of dirt and absence of systematic medical inspection, all had a direct bearing on the frequency of intestinal parasitic infection.

With the exception of the hookworm, these intestinal parasites are taken into the system by way of the mouth. Certain types of food harbor the larvæ, pork, beef, unwashed fruits and vegetables and polluted water are usually at fault. Where there is a lack of hygienic standards, parasitic infections are not uncommon.

This is particularly true of the hookworm where lack of personal hygiene and filth are the rule. In districts where human beings defecate at their convenience and inclination, hookworm is a common disease. Fortunately the dissemination of knowledge as to the spread of hookworm as well as the installation of sanitary conveniences is reducing the condition to some extent. Todd (Clinical Diagnosis) reports that 90 per cent of the rural population of Porto Rico were infected. Patterson states (Mil. Surg. 50:562, '22) that 85 per cent of the white and black soldiers he found infected with hookworm had not gone beyond the seventh grade in school and 50 per cent admitted to having gone barefooted frequently.

Hookworm is usually accompanied by general malnutrition,

with moderate anemia and arrested growth. "Southern anemia" has become a term for hookworm. The children become dull and apathetic and lack both physical and mental vigor. When the majority of the population of a district suffer from this malady, it is not difficult to picture the accompanying social and economic condition.

Pinworms, the most common of the intestinal parasites in children, live in the lower cecum and rectum and rarely go as high as the ileocecal valve. The symptoms of the pinworms, roundworms and tapeworms are similar. Annoying sensations, colicky attacks, capricious appetite and anemia are seen in all these disorders. Disturbed sleep and grinding of the teeth are frequent symptoms of the smaller worms. When the condition is severe, the child may have nervous symptoms, convulsions, epileptiform attacks, hysterical seizures and even hemiplegia and aphasia. Blood in all these disturbances usually shows eosinophilia.

Worms are usually detected in the stools and the microscopical examination of stools is very important as frequently only the ova may appear there. Too often mothers are prone to discontinue treatment as soon as no worms are seen in the stools. Stools must be examined often during treatment in all intestinal parasitic conditions and in order to make the laboratory examinations effective, these examinations should be made when the specimen is fresh and warm. This is especially true in ameboid infection as the amoeba are usually detected by their movements and cold checks this. The greatest precaution must be taken that the container is sufficiently large and the amount of fecal material not too large, so that no fecal material will spill out in transit nor get on the cover or outside and thus endanger the people who are to handle it. The receptacle should be sterilized by boiling before use but no disinfectant nor foreign substance should be put into a stool required for examination. I might add that stools not required for examination should be most carefully disposed of—segments of tapeworm should be burned and in handling stools of amebic dysentery, which is highly infectious, strict precautions should be taken to prevent the spread of the infection.

One of the most unpleasant symptoms of pin or threadworms is the itching of the anus and genitals caused by the migration of the worms from the bowels soon after the patient retires. Scrupulous cleanliness is therefore necessary. The parts about the anus should be washed with a 1 to 10,000 bichlorid solution after each stool and even several times a day. Itching at night may be controlled by the application of mercurial ointment to

the folds of the anus before the child goes to bed which will prevent the escape of the worms from the bowel. Holt considers injections of bichlorid most effective for ridding a patient of worms (see Harmer, p. 112). When worms are high in the colon, drugs by mouth must be combined with the injections. Santonin and oil of chenopodium are efficient remedies for all the intestinal worms. Santonin is best given in powdered form with sugar, usually in three doses and followed by a purge of calomel or castor oil. Santonin has the disadvantage of causing vomiting and occasionally toxic symptoms follow even ordinary doses. Oil of chenopodium is easier to administer and just as efficient. Patterson considered it more effective in hookworm than thymol. The usual dosage of oil of chenopodium is one-half drop (on sugar) for every year up to ten years and a drop for every year between ten and fifteen years. On the day preceding, give a light supper and the following morning two doses of chenopodium oil at two-hour intervals, following the last dose with castor oil. Care should be taken that an overdose of oil of chenopodium is not given as it is toxic in overdoses. Re-infection is to be avoided in pinworms and the nurse should always be sure that the child's hands are washed after a stool or whenever there has been a question of contact and her own hands should have like treatment.

Oleoresin of the male-fern is considered the most effective treatment for tapeworm. The vermifuge should be preceded by several hours fasting, a saline laxative and a large soap and water injection. A child of four years could take at least a dram of the male-fern in six to eight hours, the first dose not to be given until the laxative has acted well. After the last dose of the male-fern, castor oil or some active purgative should be given. The stools must be watched carefully as the treatment has not been effective unless the head of the tapeworm has been passed. The worm should be passed into the chamber filled with warm water to prevent the worm breaking away from its head by its own weight. If the head of the tapeworm does not come away it means that the worm will develop again.

Holt suggests the following treatment with thymol for hookworm: After twelve hours of fasting give one or more full doses of sulphate of magnesia or soda. This should be followed by 6 or 8 grains (for a child of five years) of thymol in divided doses spread over three or four hours. Two hours after the last dose, repeat the salts and do not give any food until the salts have acted.

Amebic dysentery is rare in children in this country. In acute cases there is usually a great deal of abdominal tender-

ness and pain, constipation alternates with diarrhea and the stools contain mucus and blood. The course of the condition may be short and terminate in death in two or three weeks. Emetine bismuthous iodide containing 29 per cent emetine has been given by mouth in salol or keratin coated tablets ¼ to 1 grain, two or three times a day according to age. Neo-arsphenamine has been used most effectively at intervals of four to seven days. In all these ailments it is necessary to follow the patients for a year after treatment to see if the condition has really cleared up. After the acute symptoms have subsided patients respond to change of air very well. Pleasant surroundings, careful diet and occasional irrigations are the most effective forms of treatment for the chronic patients.

Not a great deal has been accomplished in treating the flagellates (giardia, chilomastix, trichomonas, etc.) which are seen occasionally in children who have been living in the tropics or in localities where sanitary and hygienic standards are very low or lacking entirely. These are all microscopical forms and when present seem to have some effect on the nervous system as well as on the gastro-intestinal system. The patients I have seen who were troubled with giardia were suffering with indefinite nutritional conditions.

Antimony oxide given in capsule form has not proved successful. Neo-arsphenamine given intravenously rather than by rectal injection has been the most satisfactory type of treatment for the flagellates thus far. As in other intestinal parasitic infections only time will prove whether the treatment has been entirely successful. Every effort should be made to prevent re-infection, and personal hygiene is the most important element in prevention.

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CHAPTER IV

DISEASES OF THE RESPIRATORY SYSTEM

Introduction. Respiratory diseases are some of the most dreaded of infancy and childhood because the mortality from them is high. They are responsible for almost as many deaths during infancy as are the acute and chronic intestinal diseases. During the period of childhood the respiratory infections have the highest mortality of any of the diseases common to children. The child welfare work of the past ten years focused much of its efforts upon the reduction of infant mortality from the intestinal diseases and the public has been educated in the risks incident to those diseases, with the gratifying result of a reduction of deaths from those diseases. Respiratory infections have not received the same attention, and for this reason it might seem as though deaths from respiratory infections had increased during the past ten years. What has happened is that the ratio between intestinal and respiratory diseases has merely shifted and this accounts for the increasing importance of respiratory diseases in mortality statistics of childhood.

Education of the public in relation to respiratory diseases must follow if we are to affect the mortality from these diseases. The common cold, so often the source of a pneumonia in a child or of an ear abscess in an infant, must cease to be treated carelessly and flippantly by the public. The slight inflammation of the mucuous membrane of the nose and throat caused by a simple organism is responsible constantly for many deaths that might have been avoided. The common cold is fertile soil on which the seeds of infectious diseases thrive. Hardly a disturbance of the upper respiratory tract, in fact the whole respiratory system, but is the result of a neglected cold. Physicians, nurses and the public generally are too apt to pass it over with the remark, "Oh! just a slight cold; it won't amount to much."

A cold in a child is a danger signal as important as the bell at a railroad crossing. It is Nature's signal that a serious illness, an infectious disease, for example, may be on the way. And not alone the respiratory tract is involved. Simple organisms neglected become virulent ones and may spread to other parts of the body, the heart, the joints, the kidneys and brain. Tonsils and adenoids are "nests" for these organisms which

cause colds and once infected are likely to be a constant source of trouble.

If you have a cold you owe it to others not to pass it along. Coughing and sneezing fills the air with organisms and what was for you merely a cold may be for your neighbor, perhaps an infant or delicate child, a fatal illness. Defenseless children must be protected from coughing, sneezing associates, from infected linen (towels, napkins, handkerchiefs, etc.) and toys. See to it that discharges from the nose and throat of the person with a cold are never allowed to come in contact with anyone else.

Prevention is worth more than cure. Use all your influence to impress on parents and the public what hygiene means as a preventive measure. We are all constantly exposed to colds. A clean body in good physical condition can cope with such exposure. Fresh air day and night, plenty of sleep and a simple diet are excellent preventive measures for children.

If the cold is a fact, insist that steps be taken at once to cure it. The child should be put to bed and kept quiet if there is any fever. The child with a cold should assuredly not be allowed to be out playing when the weather is cold and uncertain. A cathartic at the onset of a cold and nasal drops, associated with sensible hygienic measures (rest, fresh air, simple diet and plenty of water to drink), should clear up an ordinary cold. You cannot be too careful regarding any organism which attacks the infant.

Diseases of the upper respiratory tract which we shall first consider are those involving the mouth, nose, ears, pharynx, adenoids, tonsils and larynx. Many ailments begin with upper respiratory tract infections and our most common contagious diseases, measles, whooping cough, scarlet fever and diphtheria, are localized there.

Section I. Diseases of the Upper Respiratory Tract

1. Acute Rhinitis. Among the more common pharyngeal disturbance is acute rhinitis which is characterized by a swelling of the mucous membrane of the nares, mouth breathing, loss of sleep, anorexia, indigestion and occasionally some nervous symptoms.

The first step in the treatment of rhinitis is to get rid of the mucus. Warm, alkaline irrigations of the nares and pharynx are effective in cutting the mucus. The best and simplest of these is soda bicarbonate solution (Fig. 85). Painting or instillation with other antiseptic medications assists in reducing the

condition. If there is much swelling adrenalin gives the best results and affords some comfort to the patient. The lotions and salves most frequently used in rhinitis are generally made up of menthol, camphor and albolene or liquid vaseline, which may be used either as nasal drops or salve. Some of the silver preparations, such as argyrol, may be used as drops in the nose, or painting the throat with a weak solution of silver nitrate tends to keep down the development of organisms.

2. **Acute Pharyngitis** is one of the most frequent disorders of the upper respiratory tract, the infecting organism being any one of the pyogenic (pus-forming) group. The pharynx is

Fig. 85.—Nasal irrigation.

the upper expanded portion of the digestive tube between the esophagus below and the mouth and nasal cavities above and in front. The pharynx is the portal of entrance for many diseases, both general as well as infectious ones, and it is an excellent incubator for dangerous organisms. Pharyngitis is present in almost every upper respiratory tract infection because of the abundance of lymphoid tissue in the pharynx. Acute pharyngitis may be a primary condition or it may be associated with an infectious disease. Nephritides start with a pharyngitis, and involvement of the pharynx is the most frequent cause of otitis media. Repeated attacks of pharyngitis predispose the child to many other infectious diseases (Fig. 86).

The symptoms of an acute pharyngitis may be pain, a slight degree of temperature, and in the beginning a thin secretion which becomes thicker with mucus and pus as the inflammation becomes more marked. If the condition becomes very acute there may even be hemorrhage. An irritating continuous cough is usually an accompaniment. Vomiting is often present, espe-

FIG. 86.—Correct position for holding child for examining throat.

cially in infants and very young children, because of the irritation to the stomach from swallowed mucus. Diarrhea or constipation are often associated with a pharyngitis. If there is a secondary involvement of the lymphatic glands, these become tender and cause some discomfort.

Prophylactic treatment is very important as a preventive measure as well as a protective one for other children in the family. Children should be kept away from anyone who has a

cold. Coughing and sneezing and the resulting spray should be guarded against. It is obvious that a person with an acute cold or cough should not be allowed to care for an infant or child. As many contagious diseases commence with a pharyngitis, the importance of isolation, until the diagnosis is assured, cannot be overemphasized.

The best local treatment is that of painting the throat with argyrol or silver nitrate (Fig. 87). A throat wash made of a teaspoonful of soda to a cup (six ounces) of hot water helps by gentle rinsing to remove the mucus.

Fig. 87.—Correct position for examining mouth and throat.

3. **Tonsils and Adenoids.** One of the most mooted questions in pediatric practice is the removal of tonsils and adenoids. Different groups in the medical profession have definite ideas as to this question. One group feels that the tonsils and adenoids are organs with a function to perform, that of a sieve for infecting organisms. Another group believes that the tonsils and adenoids enter into the formation of white blood cells and therefore removal is a disadvantage to the system. It may be tonsils are a protective element in infections and as long as they are able to handle these infections, removal is not advisable. Healthy tonsils and adenoids should be able to throw off the daily infections with which they come in contact. When they are no longer

able to perform this service and the child suffers from repeated colds, tonsillitis, pharyngitis, etc., it is evident the tonsils are permanently infected. This usually means your first line of defense is seriously weakened and your second (the glands) are likely to break next.

The results of infected and diseased tonsils are very far-reaching and they not only have a marked effect on the child's general nutrition but may be responsible for other serious conditions. Tonsils properly removed will not recur, adenoids may recur.

4. **Adenoid Growths.** Adenoid growths, that is a swelling produced by hypertrophy of the adenoid tissue in the roof of the naso-pharynx, are frequently seen even in young infants. These can easily be felt by digital examination and are more common than tonsillar infections. Adenoids are usually accompanied by mouth breathing, nasal discharge, and they often produce snuffles, frequent colds as well as make sleeping difficult.

If the adenoid infection is only a mild one, the medication suggested for rhinitis, bicarbonate of soda irrigations, minor astringents, iodine and some of the silver salts, is usually efficacious. Adenoid growths are especially serious in young and delicate infants. They are often responsible for infections of the middle ear, the most serious of the upper respiratory tract infections. Catarrhal laryngitis and spasmodic croup have been known to disappear after adenoidectomy. Infection sometimes extends from the adenoids to the connective tissue between the pharynx and larynx and causes retropharyngeal abscesses. Fortunately, this is a rare condition, but when present the abscess should be opened and drained. If untreated the condition usually results in death from pressure on the pneumogastric nerve or from suffocation or inspiration of the pus into the lungs if spontaneous rupture occurs.

When adenoid growths cause obstruction and are repeatedly becoming infected they should unquestionably be removed, as they certainly interfere with the growth of the chest and are quite likely to retard the whole normal development of the child.

5. **Tonsillitis** is a frequent condition during childhood and often in infancy. This is the ordinary acute sore throat in which the tonsils are enlarged and the follicles of the tonsils are filled with white mucopurulent plugs giving the typical white spot picture of acute follicular tonsillitis. It is often accompanied by fever, cough, difficulty in swallowing. The child will refuse to eat. Occasionally tonsillitis indicates the beginning of one of the infectious diseases like scarlet fever, measles and diphtheria. Sometimes tonsillitis is a rheumatic symptom and the heart

should be watched during these cases for an endocarditis or a dilatation of the heart.

Treatment should include strict isolation lest the condition be developing into one of the infectious diseases. If it proves to be a follicular tonsillitis it will clear up in a few days. A membranous tonsillitis should be treated with antitoxin pending a report as to whether it is diphtheria. For an ordinary tonsillitis an older child may use a saline throat wash or a spray of Dobell's solution. Painting the tonsils with one of the silver preparations is often effective. Where tonsillitis is associated with a rheumatic condition, sodium salicylate or aspirin should be given. Drugs must be administered very carefully to infants. If the child is subject to repeated attacks of tonsillitis, there is no question of procedure. As soon as the acute attack is cleared up, the tonsils should be removed.

6. **Cervical Adenitis** is a more infrequent disturbance during childhood since removal of infected tonsils and adenoids has become common. The cervical glands are located in the anterior and posterior angles of the jaw and the glands which drain the area of the tonsils are a little behind and below the angle of the jaw. The type of organism which is usually present in the cervical glands depends on the nature of the infection in the throat. The most common cause of infection is usually the streptococcus but almost any organism of the staphylococcus or streptococcus group may be found. When the cervical glands are infected it is often difficult to differentiate between a tuberculous involvement or a pyogenic infection (Fig. 88).

Cervical adenitis is always a secondary complication and the clearing up of the condition depends on the prompt removal of the primary cause. If the condition is not acute the application of heat or cold will reduce the glands. An ice bag is often used with older children but as children stand heat better than cold, poultices are more effective with younger children. Poultices may be either plain hot water or of bread or flaxseed. Mustard poultices must be carefully used because of their tendency to burn. The length of time a poultice may be left on is usually limited by the reaction of the skin. (See Harmer, pp. 207–212.) Hot water properly applied is better and safer than any other type of heat.

In the cases where the glands have broken down and are suppurating (forming pus) medical treatment is usually ineffectual. However, the earlier medical treatment is started on enlarged glands, the less likelihood is there of operation. Removing diseased tonsils often clears up the condition or prevents its

appearance. If suppuration has occurred surgical treatment of the glands, opening and draining, is necessary.

7. **Vincent's angina** is a mildly infectious type of ulceration of the throat, mouth and gums, which is characterized by the formation of a false membrane. It is more commonly seen in

Fig. 88.—Acute adenitis.

institutions than in private practice and is occasionally mistaken for diphtheria. The types of organisms found in the cultures taken from the lesions show a mixture of fusiform bacilli (spindle shaped) and large spirilla (spiral organism) similar to those found in noma and ulcerative stomatitis. Vincent's angina is seldom fatal unless neglected, in which case deep

ulcerations may go on to necrosis or the patient finally dies of a secondary broncho-pneumonia.

Treatment is similar to that for ulcerative stomatitis. Mild cases clear up with swabbing of the mouth and throat with a solution of potassium chlorate, silver nitrate or potassium permanganate. Internal administration of chlorate of potash together with the local application of hydrogen peroxide or a 1 per cent solution of nitrate of silver are beneficial. Saline irrigations of the mouth and throat also assist in the treatment.

8. **Croup or catarrhal spasm of the larynx** is a disturbance of infancy and early childhood marked by difficult breathing due to an obstruction of the larynx. If the obstruction is caused by the formation of diphtheritic membrane, it is often called membranous croup though the term laryngeal diphtheria is used synonymously and is to be preferred.

One attack of croup predisposes to recurrences of the disease, and infected tonsils and adenoids usually have a part in the disturbances. Anything which affects the larynx, high wind or dust, or a food indiscretion, may bring on an attack. Fortunately croup is only mildly contagious unless associated with infections of the tonsils and adenoids and the child usually outgrows the condition.

Attacks of spasm of the larynx occur almost exclusively at night. The voice is usually hoarse and may even be lost. The child has a hard, barking tight sort of cough known as a "croupy" cough. An attack may last from half an hour to two or three hours and even recur once or twice the same night. The periodicity of the condition is rather interesting. The attack usually comes on late in the afternoon or early evening. The first night is not as likely to be as severe as the second night. The third night may be as severe as the second or may be as light as the first. The whole period of the attack is from three to five days, and there may not be a recurrence of the condition for several weeks.

The prognosis in croup is good but the accompanying spasmodic symptoms are generally very alarming to the parents as they usually feel sure that the child is going to suffocate if he doesn't get immediate relief.

Treatment should be directed to the relief of the laryngeal spasm. Breathing warm moist air is beneficial and various methods have been devised for providing this in the home. The simplest of these is the "croup tent" with the "croup kettle" to provide the steam (Figs. 89–90). A sheet may be suspended over the bed, allowing a space below for ventilation and then by

FIG. 89.—Croup tent with croup kettle.

FIG. 90.—Croup tent with radiodor (an electrical device for obtaining inhalations).

means of the "croup kettle" the tent may be kept filled with vapor. (See Harmer, pp. 668–669.)

Vomiting will often relieve the spasm and the next best thing is to give the child an emetic or something which will make him vomit, ipecac or wine of antimony are effective and occasionally small doses will prevent an attack. Local application of heat to the throat is also useful in relieving a spasm. Where the spasm is severe a hot mustard bath (see Harmer, p. 402) will often act like a charm when everything else has failed to bring results. Nurses should emphasize the fact that every home where there are little children should have the ingredients for a hot mustard bath.

Prevention is more to the point than cure and if the child has a predisposition to croup, the mother should work out a regimen for him which will minimize the chances of attacks. The child should be clothed so he can stand sudden changes in temperature. His diet should be watched to prevent digestive attacks; the most important point is that he should be kept away from infection. Such a child is susceptible to colds and putting him to bed and starting preventive treatment when he has an incipient cold may ward off an attack or at least lessen the severity of it.

Acute Catarrhal Laryngitis

Acute catarrhal laryngitis is less frequently seen than catarrhal spasm of the larynx but is more severe and occasionally has a fatal termination. The symptoms are more pronounced than in croup and an attack may persist for eight or ten days with considerable temperature and sometimes prostration and cyanosis. The danger is that an attack may develop into a broncho-pneumonia.

Treatment for croup is usually beneficial in acute catarrhal laryngitis. It is important to keep an even temperature in the sick room. Hot mustard foot baths (see Harmer, p. 212) assist in breaking up the attacks. Hot fomentations over the larynx or counter irritation with mustard paste (from eight to four parts wheat flour to one part powdered mustard, according to the age of the child, mixed with lukewarm water and spread on two or three layers of muslin) is often very effective. The mustard paste should only be kept on the throat until it is thoroughly red, from five to eight minutes should be sufficient for this. Excoriations must be avoided. Applications of the poultices to the larynx should be repeated every four to six hours, according to the way the child responds to the treatment.

When the condition is extreme stimulation may be needed and

operative interference—intubation—is sometimes demanded. In most of these conditions early neglect is usually responsible for acute developments.

Otitis Media

Infections of the ears are very common during infancy, especially with all upper respiratory tract infections and for this

Fig. 91.—Correct position for holding child for ear examination.

reason the ears should always be examined when any disturbance of the respiratory system is present (Fig. 91).

The Eustachian tube during infancy and early childhood is shorter and broader than in later childhood and adult life and

therefore gives easier access to infection. Otitis media is the cause of many obscure fevers and is always to be suspected in the presence of high temperature. It is often a complication of one of the contagious diseases such as measles and scarlet fever. The otitis media accompanying scarlet fever is one of the most destructive types of this disease and is the cause of a large majority of deafness following infections of the middle ear in scarlet fever.

Otitis media at all times is a condition that must be carefully watched, as in the young infant the connection between the middle ear and the mastoid region is very intimate. Infections from the mastoid region reach the brain more easily during the

Fig. 92.—Correct position for examining ear with speculum.

early years of life because the sutures in the petrous bone are still penetrable. If the brain is reached, either a brain abscess or meningitis results and these conditions are usually fatal. Thrombosis of the vessels are rare but do occur and are a very serious complication.

Sick infants, as a rule, wave their arms and may grab their ears, but the gestures are not sufficiently marked for the physician to suspect involvement of the ears or ear ache. With otitis media, infants are usually restless and do not sleep well.

If the ears are opened (Fig. 92), a thin sero-purulent discharge may last for a few days, and then thicken and become profuse. The temperature usually drops at this point. If the

temperature continues for any length of time in spite of good drainage, involvement of the mastoid should always be suspected. In infants, the localizing symptoms of mastoid, edema, swelling, redness, lobe of ear pushed forward, may be absent but the tenderness back of the ear is usually present.

Treatment for otitis media should be directed first toward the removal of cerumen or wax from the ears, and then washing them out with a hot soda solution after which a 2 per cent phenol in glycerine can be used as ear drops (Fig. 93). Argyrol 10 to 25 per cent solution used as nasal drops will keep the posterior pharynx clean and assist in the reduction of the

FIG. 93.—Irrigation of the ear.

swelling. If there is much temperature and restlessness, antipyrin and sodium bromide mixtures may be given. When the ears are bulging and show signs of pus, lancing is necessary and this may have to be done repeatedly until the condition is entirely cleared up. The discharge must be kept washed out with the use of any one of many solutions.

Section II. Infection of the Lungs

1. Peculiarities of the Chest and Lungs in Infancy and Childhood. The chest of the infant differs considerably in shape from that of the adult in that it is rounder and shorter. At birth the circumference of the chest is 13.4 inches, by six

FIG. 94.—Method of holding baby for auscultation of chest.

FIG. 95.—Method of holding baby for percussion of chest.

months it is 16.5 inches, when the child is five years it is 21 inches and the normal child of fifteen years has a circumference of 30 inches. The ribs of the infant are more nearly horizontal, are shorter and more elastic and therefore, more easily compressed.

Examination of the chest is very important and if the child is held there must be no pressure to interfere with the child's respirations (Fig. 94–95). It is better to begin with the examination of the back as this tends to reassure a child who is frightened. The baby may lie across the nurse's or mother's lap, an older child may kneel on the nurse's lap with his arms around her neck and the nurse's arms around his buttocks, in this way no pressure is put on the chest.

Respirations at birth are 35 per minute, by the end of the first year 27, second year 25, sixth year 22, and when the child reaches 12 years they are 20 per minute. Respirations are abdominal in type during infancy and for this reason it is easier to count them by watching the abdomen. Unequal breathing may be caused by slight pain on one side which may be abdominal in origin or there may be no definite specific cause. Changes in breathing are very common and should be very carefully observed when the child is quiet.

2. **Bronchitis** is the most frequent infection of the lungs at all ages, though it is more often seen between the sixth month and the third year, and from the third year to puberty bronchitis is frequently seen. It is a disease which is due to a number of causes, but it is more generally associated with malnutrition and poor hygienic conditions. The child who is subject to repeated colds, infected tonsils and adenoids or is rachitic, is very likely to be a victim of acute bronchitis. Occasionally it is the result of direct infection accompanied by exposure. It is sometimes associated with infectious diseases; measles, for example, sometimes starts with an acute bronchitis as well as a coryza. It is not unusual to see acute bronchitis as an accompaniment of an intestinal upset. These types of infections often play into each other's hands in a very marked way, as a respiratory infection lowers the capacity of the gastro-intestinal tract.

Every organism has been found during an acute bronchitis, though stapylococcus, streptococcus, influenza or pneumococcus are the most common to this condition. When streptococcus, pneumococcus or influenza is present there is more likelihood of the condition developing into a broncho or lobar pneumonia.

The lung is made up of what might be called a tree, the trunk being the large bronchus, which extends into the medium-sized bronchi or limbs and finally become the small bronchi or

branches, these last being surrounded by cells or alveoli. In acute bronchitis the bronchi alone are affected. You can have a bronchitis without a pneumonia but you can hardly have a pneumonia without having a bronchitis.

The symptoms of acute bronchitis in childhood are practically the same as during adult life. There is a slight rise in temperature, a cough, usually deep and loud, slight acceleration of the breathing and definite rattles (so-called rales, that is air passing through liquid masses) which can be heard in the trachea. The type of rales heard depends on the particular bronchi involved. Loud sonorous and bubbling rales come from the larger bronchi and sibilant, crackling sounds from the smaller tubes. The severity of the symptoms depends on the strength of the child affected, while there is more danger for a weak, delicate infant or child, yet the symptoms in this type of child are usually not as severe as in the more vigorous one. The cough associated with bronchitis may be of spasmodic type resembling the cough in the beginning of whooping cough. The bronchial cough, however, is accompanied by more marked signs of prostration and in delicate children more cyanosis and more difficult breathing. The respiration is more rapid and superficial. The child's skin becomes dusky, there is pallor and a clammy perspiration. The child may even go into stupor or convulsions.

One infection of the upper respiratory tract usually means another. Acute bronchitis attacks often follow rapidly one upon another, lessening in severity and slipping gradually into the more or less chronic type. This latter is marked by a hacking cough the first thing in the morning, or after going to bed, or at other times during the day, and slight upsets will often bring this submerged type of bronchitis back again to an acute bronchitis.

Treatment for acute bronchitis should follow the lines of common sense. The inflamed bronchi need rest and the best way to secure that is to put the child to bed and keep him quiet. Fresh air is still a mooted question. Cold air increases the spasms and undoubtedly a well-ventilated room where an even temperature can be maintained and drafts kept out is better.

Inflammation is always associated with an excess of secretion. This must be rendered more fluid by inhalations of moist heat. Turpentine, eucalyptus or sodium benzoate, or almost any of the coal-tar preparations may be combined with the steam. They probably add little to the effect of the vapor but have a psychological effect on the parents, who feel that something definite is being done. In the wards, hot water steam is generally used

because of the lack of smell. The child should be moved from side to side regularly to assist in the expulsion of the secretion.

Local applications of mustard poultices to the chest, back and front are beneficial. A mustard bath or a pack followed by a cotton-wool jacket in more severe cases is usually productive of good results. Turpentine stupes (see Harmer, pp. 205–206) are also good. When the secretion is excessive and the child is strong enough to stand it, an emetic will lessen the tightness in the throat and may bring on vomiting which will often relieve this condition. In delicate infants where one does not wish to use ipecac, vomiting may be induced by touching the back part of the pharynx, making the child gag and vomit. Ipecac is one of the best drugs to promote free secretion of mucus and so is used when the cough is tight. Even in strong infants and older children it is best not to use it to the point of uncomfortable nausea, though vomiting will relieve the child of any mucus that has been swallowed and at the same time loosens the cough. Where there is little or no secretion, ammonium chloride will increase the secretion. This drug on account of its bad taste is usually prepared with some sour mixture such as the syrup of citric acid. If the cough is very prolonged and profuse, turpin hydrate is used to advantage. An irritative cough without much secretion may be more easily relieved with codein alone or in turpin hydrate.

The diet during bronchitis is always important as it is necessary to avoid other upsets at this time. The child's tolerance for food is lowered and the strength of the food given him should therefore be reduced. An acute intestinal upset may thus be avoided.

Complete recovery from an attack of acute bronchitis is perfectly possible if proper care and precautions are taken. Those in care of the case must ever be "on guard" to see that the child is given the full chance to regain normal sound health. A child may be well one day and sick with bronchitis the next day, but a child cannot be sick with bronchitis one day and entirely well the next day. Convalescent care is of vital importance to complete recovery and everything should be done to build up the child's resistance. Change of surroundings and sometimes a tonic to increase the child's lagging appetite are often of great help in getting the child back to normal.

3. **Pneumonia** is a dramatic disease and nursing plays the leading role in its treatment. With its sudden onset, high temperature, frequent nervous symptoms produce an alarm in the family which is not without justification. The mortality from pneumonia is high during infancy and early childhood. After

five years the disease becomes less serious but none the less acute and stormy. With all the advance in medical science, the pneumonias still remain among the few conditions which have not been materially affected. Laboratory investigations have not developed any specific, such as is now available for diphtheria and epidemic meningitis. Nursing, therefore, remains the most important factor in reducing the mortality of pneumonia and improved technique in nursing has relieved the pneumonias of many of their most uncomfortable aspects.

The two principal types of pneumonia are bronchopneumonia and lobar pneumonia, these terms signifying the particular location of the pathological process in the lungs. Of all the acute infectious diseases, pneumonia probably has the highest mortality.

1. **Bronchopneumonia** is the form of pneumonia most frequently seen during the first four years of life. Infants are particularly susceptible because of the undeveloped condition of their lungs and the fact that during this stage of life the bronchi are the predominating structures in the lungs (Chart 9).

In bronchopneumonia the areas of inflammation are scattered here and there in the bronchi and alveoli, and occasionally these areas coalesce to form larger areas. With congestion and swelling of the mucous membranes of the bronchi appear coarse, sonorous and finer sibilant rales, the distinctive sign of bronchopneumonia. Consolidation may or may not take place. When it does there is bronchial breathing, increased vocal resonance and sharp rales. Consolidation and congestion of the blood vessels not only impair the power of the lungs but interfere with the action of the heart as well.

Bronchopneumonia may occur as a primary disease or secondary to some other condition. Primary bronchopneumonia, which according to Holt, is seldom seen after four years of age, is usually caused by the pneumococcus, though other organisms, the streptococcus, staphylococcus and influenza bacillus, may be associated with it.

Secondary bronchopneumonia usually follows such infectious diseases as whooping cough, measles, influenza, diphtheria, etc. Occasionally gastro-intestinal disorders are complicated by bronchopneumonia as a secondary condition. Malnutrition is often a predisposing factor in bronchopneumonia, especially in homes where hygienic standards are low.

Whether as a primary or a secondary condition, the prognosis in bronchopneumonia is always grave. When primary, it is serious because of the early age of the patient and when secondary, it occurs as a complication of an already serious illness.

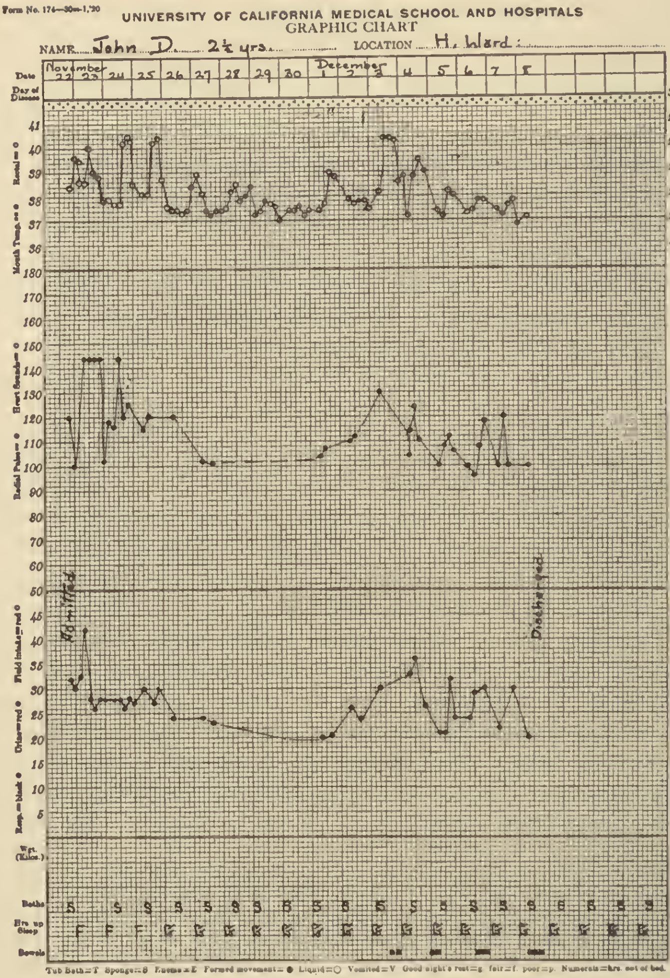

CHART 9.

Legend for

John D. (Hospital No. 12633)

Age: 2½ years.

Diagnosis: Broncho-pneumonia complicated with acute otitis media and cervical adenitis.

Child was admitted on the 22nd of November and discharged on December 8th.

Family history negative.

Past history showed that he had whooping cough when a year and a half old and chicken pox at the age of two years. The present illness started two days before admission to the hospital, when the child started to cough. This was followed with difficult breathing and he became feverish. On admission, examination showed a well-developed boy with

Even in good homes, under favorable conditions the issue is often doubtful though bronchopneumonia is seldom seen in these surroundings. When bronchopneumonia occurs as a secondary condition in institutions, the mortality sometimes runs up to 75 per cent of the cases affected. Fortunately this disease becomes less fatal with increase in age.

The onset of bronchopneumonia as a primary condition is generally sudden, if secondary it is more likely to come on gradually and even insidiously. As has already been said, bronchitis is usually a precursor of bronchopneumonia. The temperature chart is always interesting in a bronchopneumonia. Ordinarily, the temperature is high, irregular or remittent in type. The daily fluctuations often amount to 3 or 4 degrees. Occasionally temperature will persist in a bronchopneumonia for weeks and even months but usually it ends by lysis anywhere from seven days to three weeks. In young and delicate children, the rise in temperature may be slight, and a poorly nourished infant may even die from pneumonia without having had an elevation of temperature during the course of the disease.

The respiration is rapid and labored, more often above 80 than below 55, and the child gets short of breath on the slightest exertion. Occasionally there is respiratory failure which may cause death. In 75 per cent of the cases the pulse is over 150. When it is under 140, the prognosis is usually good, though this is not invariably true. The cough is shallow, short and hacking and often so incessant that the child's rest is disturbed.

The nurse needs to realize that prostration and cyanosis are

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markedly flushed face and some difficulty in breathing. The respirations were forty per minute and labored. He coughed occasionally, quite severely. His physical examination showed that his tonsils and adenoids were enlarged. There were numerous cervical glands. Examination of the chest showed numerous small areas of consolidation and an extensive bronchitis. His white count was 20,300 with 81% polymorphonuclear cells. His urine showed a slight trace of albumin. His nose and throat cultures showed a mixed culture including streptococci but no pneumococci. His course in the hospital during the first four days showed that his temperature fluctuated in long septic swings between 37.7°C. (99.8°F.) and 40.7°C. (105.2°F.). His pulse was considerably increased, his respirations were at times, but on the whole, not nearly as much as found in cases of true lobar pneumonia. He was treated with tepid sponges and was given inhalations of tincture of benzoin compound which relieved the cough.

During the next four days his temperature dropped by lysis to within normal limits and he felt very much better. His white count dropped to 10,700. During the next three days his temperature gradually rose to above 40°C. (104°F.) and the white blood cells rose to 36,000. Examination showed the lung condition was improving. The areas of consolidation having practically disappeared and the bronchitis was considerably diminished. Both ear drums were found bulging and had to be opened. Following this the temperature dropped to within normal limits and the child was discharged in good condition.

likely to occur at any time. As the cyanosis is often followed by respiratory failure, it is one of the danger signals she should be on the watch for and guard against. Nervous symptoms, convulsions and delirium are infrequent at the onset of pneumonia and usually depend on the intensity of the infection as well as on the complications. Gastro-intestinal symptoms are not infrequent because of the weak digestive ability of the infant due to the fever, together with medication and often injudicious feeding which will upset the stomach. There may be four to six greenish stools a day which contain mucus and undigested food.

The blood in a bronchopneumonia usually shows a moderate secondary anemia and in protracted cases a leucocytosis is almost invariably present. In an ordinary case of bronchopneumonia the leucocytosis ranges from 20,000 to 40,000 and sometimes even higher. The polymorphonuclear cells are generally responsible for this, as they comprise from 60 to 85 per cent of the total leucocytes. When the temperature falls the leucocytosis usually falls with it, though a too rapid drop of temperature and leucocytosis may be a bad sign of loss of resistance in the child.

Urine is usually scanty, highly colored and filled with urates and occasionally a trace of albumin is seen when the temperature is very high.

Skillful nursing, as has been said, is an essential element in the treatment of bronchopneumonia. The physician depends on the intelligent execution of his orders by the nurse and he must also depend on her keen powers of accurate observation of the various symptoms as they develop in the course of the disease. The nurse who is "on the job" will report her findings early and give the physician time to forestall possible disturbances by instituting immediate measures for relief. This may mean the prevention of serious complications.

Respiratory failure, one of the most grave developments in a bronchopneumonia, is a case in point. Generally it is preceded by cyanosis. When dyspnœa and cyanosis appear, the physician should be notified immediately. If he cannot be located the nurse must resort to emergency measures at once. The child's life depends on her coolness and skill. If she is excitable and nervous, her skill will avail her little in coping with the situation. These are some of the general principles involved in the nursing of a child suffering from pneumonia (see Harmer, pp. 501–502).

Bronchopneumonia being usually a secondary disease is apt to have more complications following it than lobar pneumonia. The most frequent complications are otitis media, pyelitis, empyema and acute gastro-intestinal disturbances (Chart 10).

Otitis media may develop at any time during the course of the disease and may even recur several times during a long siege of bronchopneumonia. This is especially true if there has been present a subacute or chronic infection of the nose and throat. Pyelitis is another obscure type of complication, often contributing no symptoms that would indicate kidney involvement, therefore the urine should be repeatedly examined. Empyema usually occurs late in the course of bronchopneumonia or after the lungs are apparently clear. When empyema is present the temperature becomes more septic and if the fluid is in any quantity, the appearance of the chest will indicate it, as there will be less movement in respiration on the side where the fluid has accumulated and often the spaces between the ribs will be bulging. These two signs give the affected side of the chest the appearance of being larger and rounder. Such evidence of empyema is only possible to detect in the thin or emaciated infant or child.

Treatment is entirely symptomatic. Stimulants or sedatives should be given only when absolutely required. Hygiene, fresh air and diet are the essential elements in treatment. Rest is indispensable, as the child requires all the strength he can muster to combat the disease and all exertion on his part must be prevented. His clothing must be easily removed and of a type which will not interfere with his breathing. The bedding must also be carefully arranged so that it will not bear down on the child's already overworked chest. An inverted cradle over which bed covers can be suspended, thus removing the weight of the covers and allowing the chest full play, may be used. The small patient must be kept warm but he must also have an abundance of fresh air. His extremities can be kept warm with hot water bottles and draughts kept off by properly arranged screens. Cold fresh air apparently has a tonic effect on a child suffering from pneumonia and is a point in treatment which should not be neglected. However, cold fresh air must be used discreetly as it may increase the coughing in the bronchopneumonia and for this reason the nurse must watch the effects of it very carefully.

Frequent changes of position are necessary but the nurse must make these changes with as little disturbance as possible. Sometimes the child gets a measure of relief from being held upright and he should either be held in the nurse's arms or if large enough propped up in bed for a few moments occasionally.

Diet is a factor in treatment to be carefully regarded during a pneumonia. Proper diet helps out the resistance and improper diet is likely to bring on gastro-intestinal complications. Liquid

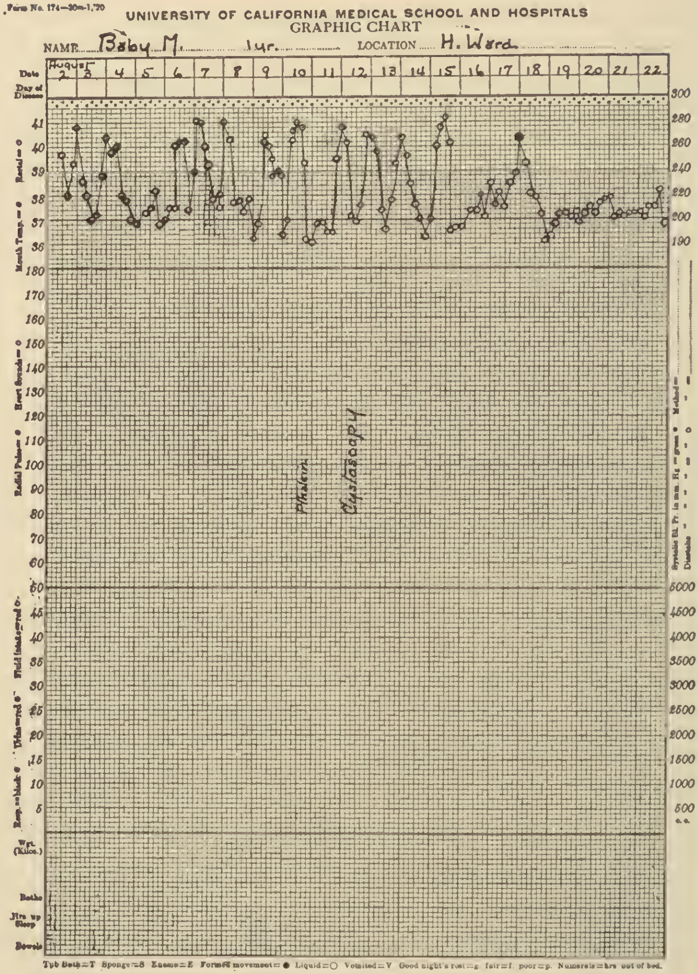
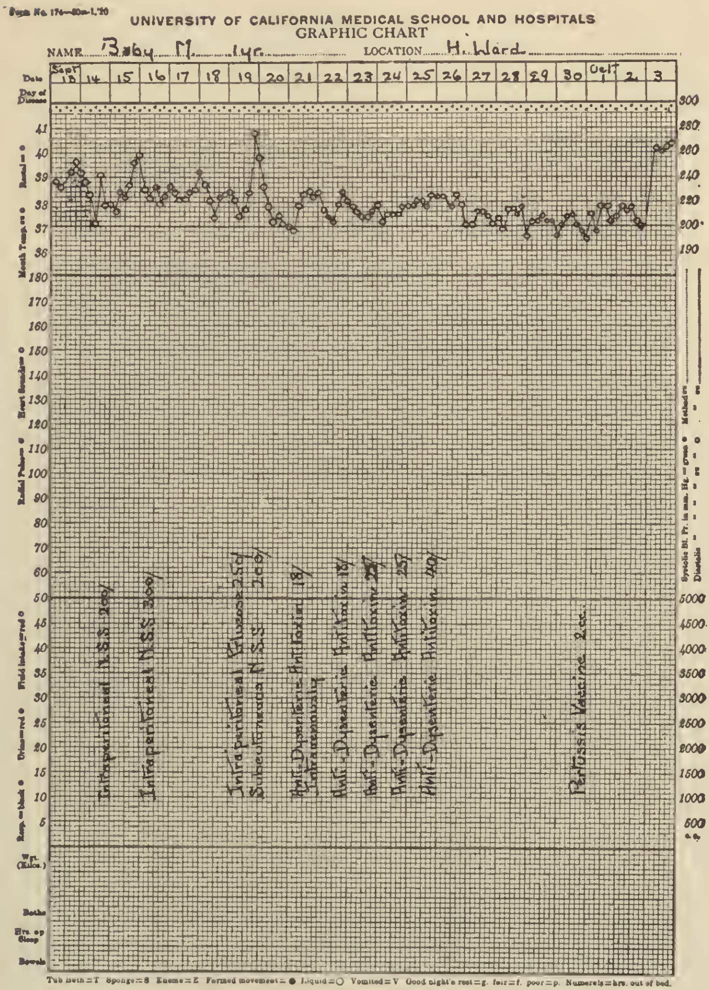


CHART 10.
Legend for
Baby M. (Hospital No. 16731)

Age: One year.
Diagnosis: Broncho-pneumonia, double otitis media, pyelitis and infectious diarrhea.

The child was admitted on August 2nd and discharged on October 23rd. She was brought in on account of "feverishness." Previous history to present illness is unimportant. She had done well throughout the first year. Her weight at entrance was 9,250 grams, or approximately 20 pounds, which shows that she was somewhat underweight. Her present illness had lasted for the past three days when her temperature fluctuated between 99°F. (37.3°C.) and 106°F. (41.2°C.). She had vomitied several times. Her physical examination on entrance showed a pale, irritable, toxic appearing child. The positive physical findings were a small area of consolidation at the right base and reddened ear drums. The white count was 26,400, 76%



polymorphonuclear cells. Her urine showed a trace of albumin and a number of granular casts. As seen by her temperature chart her temperature fluctuated between subnormal and 41°C. (105.8°F.). The consolidated area in her lung during the course of her illness shifted from one lobe to another until during the course of her stay in the hospital every lobe had been more or less involved. Both ears had to be opened. A week after her admission her urine was found to contain many pus cells indicating the development of an acute pyelitis. Treatment for this condition included forcing fluids—alkaline treatment, and on the 12th of August direct irrigation of the pelvis of both kidneys—following this her temperature gradually fell. Between that time and the 13th of September when the second temperature chart begins, her temperature had fluctuated at various times between normal to over 40°C. (104°F.). From the 8th of September on her temperature remained high. She developed a marked diarrhea during this period and showed signs of dehydration for which she had to receive intraperitoneal salt solution. Her stools gradually showed signs of

food should be given in small quantities at regular intervals and if necessary a delicate infant may be tube fed.

The treatment suggested for bronchitis can be applied with good results in bronchopneumonia. The nasal passages must be kept clear and carefully syringing them every day with an alkaline or antiseptic lotion is usually effective. The mouth should also be cleansed carefully every day.

Cool sponges will often reduce a high temperature but it should be borne in mind that a pneumonia temperature is a septic one, usually ranging between 101° F. and 104.5° F. and reducing it by such means may do more harm than good. Medication must be used very cautiously during bronchopneumonia because of its effects on the gastro-intestinal system. Steam inhalations or hanging steaming hot towels about the room often relieve coughing and promote bronchial secretions. A simple alkaline expectorant mixture will often give the same results.

Stimulant measures are necessary when cyanosis and respiratory or circulatory failure are imminent. Mustard bath and inhalation of oxygen are usually beneficial if resorted to without delay. Mustard paste, mustard pack or turpentine stupe are all useful. Dry cupping is also helpful in cyanosis (see Harmer, p. 335).

What has been said of bronchitis can be emphasized for bronchopneumonia. The parents must not be satisfied with the child's condition until he has completely recovered. Change of air, to a warmer climate during the winter or to the mountains during the summer, and the institution of sun treatments have been followed by very good results. Cod liver oil and tonics for the appetite, as in bronchitis, are of assistance in restoring the child's system to normal.

The nurse must not neglect her own health during this siege and should make every effort to keep herself in good physical condition while in charge of a pneumonia patient. Precautions suggested for infectious diseases should be just as conscientiously adhered to in pneumonia. A nurse is more likely to contract

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pus with very little blood. The culture of her stools disclosed the presence of Flexner type of dysenteryae bacillus. She was given anti-dysenteric antitoxin intravenously five times during which time her temperature came down to normal and remained so until October 2nd. From September 30th on she developed a cough which was rather spasmodic in type. Fearing that she might have whooping cough she was given a prophylactic dose of pertussis vaccine. Her temperature, which rose to over 40°C. (104°F.) on the 3rd of October, fell to normal on the fourth with but one or two slight oscillations which were due to a stopping up of her ears which had to be repeatedly re-opened. Her temperature remained normal and she was discharged in fairly good condition on October 23rd.

This case illustrates a rather exaggerated but not uncommon type of marked broncho-pneumonia with various complications.

pneumonia or influenza than measles or whooping cough and the end results are far more serious for her.

2. **Lobar pneumonia** (by some authors called croupous pneumonia) occurs at all ages but it is less common in young infants than bronchopneumonia. It is rather a disease of middle and late childhood. Lobar pneumonia is an inflammation of the alveoli, the bronchi being scarcely involved. Usually an entire lobe of the lung or a clearly demarcated portion of the lobe is

Fig. 96.—X-ray of chest, normal heart, but lungs show moderate amount of bronchial thickening.

involved (Figs. 96–97). The inflammation is commonly limited to a single lobe or if there is greater involvement another entire lobe is generally affected.

Studies show that pneumococci belong to four groups, each group having its own peculiarities as to severity of infection, incidents—that is the number of individuals ordinarily infected—and mortality. Fortunately, the most common type of pneumococci are the less virulent. A specific serum has been de-

FIG. 97.—Shows X-ray picture with left-sided pneumonia. The dark shadow on the left side is consolidated lung.

veloped for one of the more virulent groups (group 1) which is effective in this one group only. This serum must be used early to be of much value. For this reason, early blood cultures are indicated. With the pneumococcus are often found other organisms such as the streptococci, influenza or staphylococci.

The onset in lobar pneumonia is usually sudden with well marked symptoms, vomiting or diarrhea, prostration and pain (pleuritic) this last often mistaken, because of its location, for a high appendix inflammation. Respiration is always very rapid, usually in proportion to the amount of lung involvement. The ordinary pulse respiratory ratio is 1 to 3. In lobar pneumonia this ratio is as 1 to 2. The respirations increase at a greater rate than the pulse. The breathing is characteristic, a short inspiration, pause, a quick expiration accompanied by a short grunt with the marked movement of the nostrils. The rate of the pulse is increased but its rate is not as important as its quality; i.e., whether it is regular or irregular, strong or weak, as these signs indicate more clearly the condition of the heart. Temperature usually rises to 104 or 105° F. and remains there with only slight daily fluctuations of one or two degrees until the crisis (generally the seventh day) is reached when it falls to normal usually within twenty-four hours (Chart 11).

Frequently there is a pseudo crisis which takes place twenty-four to forty-eight hours before the crisis in which the temperature makes a sudden drop but does not go below normal as it usually does at the true crisis. Many cases of lobar pneumonia do not end by crisis, but the temperature drop is by lysis which may take anywhere from several days to a week or more in returning to normal. In young children, the lobar process may move from lobe to lobe so that there is a return or more truly a continuation of the disease over a much longer period (Chart 12).

Cyanosis is rare and as in bronchopneumonia is usually a sign of respiratory failure. Leucocytosis is more common to lobar pneumonia than to bronchopneumonia. An X-ray study of lobar pneumonia shows that consolidation occurs early, usually at the surface of the lung and from here extends inward. No air enters the air vesicles of the consolidated section of the lung which is shown by exaggerated vocal fremitus and marked dullness. Over the rest of the long so-called "cracked-pot" resonance is occasionally heard. Rales are usually absent until resolution commences when bronchovesicular breathing and moist rales of all kinds are heard.

If lobar pneumonia ends in death, it is due to exhaustion or to toxic effect in the respiratory or circulatory centers. The symptoms of central respiratory and circulatory failure are cold-

CHART 11.
Legend for
Amerian A. (Hospital No. 11243)

Age: 8 years.
Diagnosis: Lobar Pneumonia.

This chart shows a typical temperature and respiration curve of a case of lobar pneumonia.

On the day before the crisis there was a slight pseudo crisis followed

Form 140—25m-6,'20

UNIVERSITY OF CALIFORNIA

UNIVERSITY HOSPITAL HAHNEMANN HOSPITAL

NURSE'S RECORD

Name *American A.* Location *H. Ward*

Hours	Temp.	Pulse	Res'n	Urine	Stool	Medicine	Nourishment	Remarks
A.M.	—	July 7, 1921				—	Thursday	—
2:00							H_2O 150	Tepid sponge
3:00								Pt. sleeping
4:00							H_2O 150	Coughing
5:00				✓				Tepid sponge
7:00						Sod. Bicarb 1		
							Milk 200	Specimen to lab.
								Rattling sound in throat.
9:30				✓				Gen. H.M. care.
						Sod. Bicarb 1	Milk 200	
10:00								
11:00							Orange Juice 200	
P.M.	—							
1:00						Sod. Bicarb 1	H_2O 150	
							Chocolate	Pt. to X-ray
1:30							Milk-shake 150	Pt. back from X-ray.
2:00	$40^{\underline{8}}$						H_2O 300	Tepid sponge
4:00						Sod. Bicarb 1		
6:00							Milk 200	Tepid sponge
6:30				✓			H_2O 150	
7:00							Chocolate 150	
				✓	✓			Sm. hard brown stool.
8:00							H_2O 100	
9:30							H_2O 130	Ice cap over heart and to head.
								Tepid sponge.
A.M.	—	July 8, 1921				—	Friday	—
1:00								Sleeping
3:00							H_2O 130	Tepid sponge — Pt. coughing.
5:00							H_2O 130	
6:30							H_2O 130	Tepid sponge.
7:00				✓			Milk 200	
8:00						Sod. Bicarb 1		
							Milk 200	
9:00							Eggnog 200	Tepid sponge. General H.M. care.

NURSE MUST SIGN AFTER EACH RECORD MADE.

by a rise in temperature then followed by the true crisis. The nurse's record sheet for one whole day and part of the second day is appended showing the type of treatment carried out.

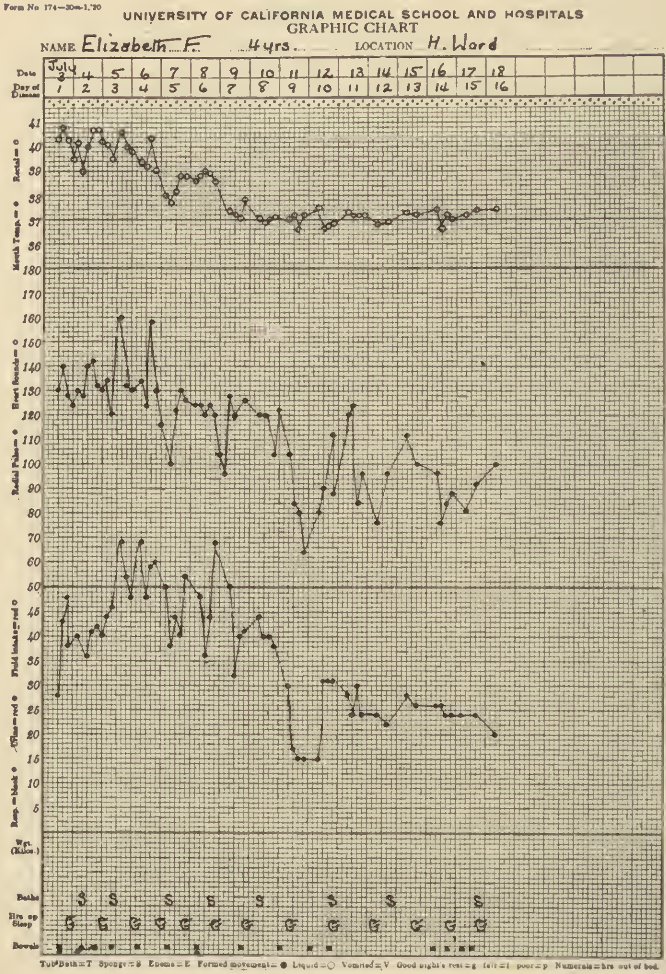

CHART 12.

Legend for

Elizabeth F. (Hospital No. 1544)

Age: 4 years.

Diagnosis: Lobar Pneumonia complicated with Otitis Media.

Family history is negative. She had been a perfectly healthy child except for the following illnesses: She had measles at the age of two and one-half years, mumps following measles and whooping cough during the past summer. Two weeks before entrance she had contracted a "cold." A week before admission to the hospital her temperature went up suddenly and she began to cough a great deal. She came in with a flushed face and was quite toxic. Her physical examination, with the exception of the lungs, was practically negative. The lungs showed a consolidation of the left lower lobe. This was confirmed by an X-ray picture. Her blood

ness of the hands and feet, rapid and irregular pulse and muscular weakness and pallor and cyanosis as in respiratory failure.

The prognosis depends on the condition of the child before the attack, the extent of the involvement of the lungs, as has already been said and the complications. Pain is a very frequent accompaniment of lobar pneumonia and when it appears early, it simply indicates a dry pleurisy. The pain is sometimes referred to the abdomen and when it occurs on the right side often simulates appendicitis. This fact makes the differentiation between lobar pneumonia and acute appendicitis a very complicated and difficult one. When the pain occurs late, after the crisis, or if there is no crisis, in the later days of the fall of temperature by lysis, it more often indicates a purulent empyema. However, the beginning of empyema may not have any pain but is indicated by a rising septic temperature, loss of appetite, increased weakness, in fact all the signs of septic absorption. Other complications of lobar pneumonia, otitis media, pyelitis and gastro intestinal disturbances, are found less frequently with lobar pneumonia than with bronchopneumonia. Lobar pneumonia may also be complicated with a bronchitis or a bronchopneumonia.

The general treatment suggested for bronchopneumonia applies to children suffering from lobar pneumonia. Rest in a well-ventilated room or in the open air, if the climate permits, careful feeding and skillful nursing give the most satisfactory results in the majority of cases. Lobar pneumonia is a self-limited disease and no treatment so far has been found to prevent the course of it. Specific serum as stated is only applicable to one group. Drugs are to be avoided as much as possible. Cold sponge baths or ice bags will usually reduce the temperature if excessive and the child is very restless. Care should be taken, however, in giving cold sponges, etc., to see that the child's extremities do not become too cold. Water should be given in as large amounts as possible and at frequent intervals. Sleeplessness is sometimes due to constipation and a warm enema or castor oil may give the desired relief. Codein or Dover's powders may be given for pain, also for sleeplessness and cough when severe. Stimulants are usually not required

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picture showed 35,000 white cells. Her temperature remained between 39°C. (102.2°F.) and 41°C. (105.8°F.) the first four days. On the day after admission her temperature began to fall and with a slight rise on the fifth and sixth day came down to normal on the seventh. The rise on the fifth and sixth day was due to a double otitis media which developed. Both ears were opened and the temperature fell following the opening of the ears and remained normal during the rest of her convalescence. The rise in the pulse and respiration follows very closely that of the temperature.

except in extreme respiratory or circulatory conditions and should be used as in bronchopneumonia.

3. **Pneumonias of Unusual Duration.** Although the usual lobar pneumonia has a periodicity of from seven to nine days, there are unusual cases which give the initial picture of the lobar pneumonia with its rapid rise in temperature and the change in pulse and respiration ratio, with definite signs of the beginning of consolidation in the lungs, which end in twenty-four to forty-eight hours with a sudden crisis. On the other hand there are cases of pneumonia that extend over a much longer period.

4. **Slowly Resolving or Unresolved Pneumonia.** Cases of slowly resolving pneumonia in children are occasionally seen. These cases often drag on for weeks showing the typical signs of pneumonia. The temperature in these children is usually not as septic as in broncho and lobar pneumonia though they may run a fairly high temperature. At times abscess formation or gangrene may be a complication or the condition may entirely clear up by the process being slowly absorbed.

Treatment in unresolved pneumonia is practically the same as for the other types of pneumonia we have discussed. Change of air is particularly effective accompanied by tonics to build up the child's resistance.

Acute congestion of the lungs and edema of the lungs appear more often as complications of either bronchopneumonia or lobar pneumonia, in fact a certain degree of congestion and edema are usually present but occasionally these conditions may appear to present a primary picture. Such instances of rapidly progressing edema are not uncommon as terminal conditions in many chronic as well as acute diseases—such as in cardiac disease, nephritis or a general infection.

4. **Pleurisy,** as already stated, is one of the complications of the pneumonias. The pain in early pneumonia is due to a dry pleurisy, i.e., where the two pleural surfaces, one lining the chest cavity, the other lining the lungs, become roughened due to the inflammation. Dry pleurisy is practically always a secondary process. Serous pleurisy may be either secondary or in rare cases primary. It is very rare during infancy and rather uncommon during childhood, except as a manifestation of tuberculosis or as part of the picture of general ascites. In generalized ascites of course, the condition is due to circulatory failure which may be due to a cardiac condition or a nephritic condition.

Empyema or purulent pleurisy is the type most frequently seen during childhood. It is due to a direct invasion of the pleura by some one of the micro-organisms. During lobar pneu-

monia it may be the pneumococcus which is the most frequent cause of empyema. During an influenza epidemic the streptococcus type of empyema prevails. The type of exudate depends on the organism. The production of fibrin, pus and serum is much thicker in pneumococcus empyema than streptococcus. The streptococcus fluid is often very thin and resembles a serous pleurisy (Fig. 98).

Empyema may develop insidiously during the course of a pneumonia or after a short convalescence. Pain is often absent as a symptom due to the fact of the rapid accumulation of fluid

Fig. 98.—Method of thorocentesis.

which separates the inflamed pleural surfaces. The temperature rises in step-like manner characteristic of septic infections. Coughing may be an early symptom due to the reflex pleural irritation. The child's appetite begins to fail, anemia may develop rapidly, the pale yellowish appearance of the septic child is very characteristic. As the fluid increases in quantity the breathing becomes more rapid. Digestive disturbances often accompany these specific symptoms, vomiting and diarrhea further increasing the severity of the condition. The blood picture shows an increase in the polymorphonuclear leucocytes. The pulse is usually increased. If the effusion is on the left side, there may be very definite cardiac embarrassment due to the mechanical factor of the heart being pushed either to the right

or upwards. With this, dyspnœa increases and the child may not be able to lie down (orthopnœa).

The prognosis in an empyema depends on several relative factors, the age of the child, general condition, exciting cause and the complications. During infancy mortality is high but older children generally recover satisfactorily if proper treatment is started early.

Treatment of pleurisy may be divided into the supportive treatment, i.e., the general hygienic and dietetic measures, and the local treatment directed toward the removal of the fluid. In simple serous effusions there may be considerable absorption without resorting to the removal of any fluid. Sometimes after one thoracentesis, and the removal of part, if not all the fluid, there will be rapid absorption of the remaining fluid. The chest must sometimes be tapped many times. The precautions in tapping the chest are the use of absolutely sterile methods (see Harmer, pp. 351–354).

The treatment of purulent effusions depends on the nature of the effusion. In the streptococcus effusions, repeated withdrawal, or continuous aspiration by some of the surgical methods developed during the late war by which constant drainage is kept up by negative pressure, has been more successful than the older method of operating early. During infancy, the method of continuous aspiration has been used successfully, in even thick effusions. The thicker the fluid the more necessary are the direct surgical interventions of either resecting a portion of a rib or opening up an intercostal space to obtain free drainage. In the surgical method, tubes are introduced and the effusion washed out. The drainage tubes may have to be left in some time, until the discharge disappears and the wound closes in. Chest deformities resulting from operative measures are, of course, much greater than those following the use of suction and the vacuum pump or by simple siphon drainage. There may be some deformities from adhesions of the two surfaces of the pleura, under any conditions, but much of it can be avoided, if special attention is given to the early expansion of the lungs and corrective chest and breathing exercises.

5. **Influenza** infections during infancy and childhood are not nearly as prevalent or as severe as in adult life. It may either take the form of epidemic or may be found in sporadic or isolated cases. Influenza, as demonstrated by the epidemic of 1917–1918, is most infectious and the main evidence developed from the studies was that the epidemic was spread by healthy carriers. In the ordinary population, from 8 to 12 per cent of individuals may be found to have influenza bacilli in cultures

taken from the nose and throat. Among certain army camps, the incident of carriers was as high as 88 per cent. These figures emphasize the need of protecting young infants and children, especially during an epidemic. No one with the slightest upper respiratory tract infection should have charge or even come near children during such epidemics.

The three types of this disease found among adults are found in children. These types are the catarrhal, gastro-intestinal and nervous. In most reported epidemics, these types ran in about this sequence. In most instances, the disease began with sneezing and profuse nasal discharge. As the infection spread down the respiratory tract, coughing with bronchitis was the general rule. The prostration, headache, backache, general malaise were less prominent in very young children but common among older children. As in adults, the most serious complication was pneumonia followed by streptococcus empyema. The organisms primarily causing influenza has been much debated but the general consensus of opinion is that the infection is due to a small filterable organism (Bacterium pneumosintes) associated with the influenza bacillus in epidemics. All the proofs for this have not been completely or satisfactorily worked out. Uncomplicated influenza rarely killed. The great mortality was from the complications and these in the majority of cases were caused by some one of the streptococci. During the late epidemic, the complication of otitis media with mastoid involvement was rare in some parts of the country and very frequent in others. The gastro-intestinal type of influenza was not infrequently found in certain sections of our country. The general symptoms of this type were the same as in the catarrhal form; the localizing symptoms were vomiting, diarrhea and abdominal pain. The nervous type of influenza was rarely seen. Most of the nervous symptoms reported during the influenza epidemic could be satisfactorily explained by the high temperature and the other general symptoms.

The prognosis in mild cases is very good. In severe cases the mortality sometimes runs as high as 40 per cent. This is especially true of hospital cases which are likely to be more serious, and complications are very much more frequent because of contact with carriers or patients with other infections, especially the pneumonias.

The treatment of influenza is purely symptomatic. Careful and individual nursing is essential. Complete isolation of each case is necessary. In the care of the case all the procedure outlined for the contagious diseases should be strictly observed. Fluids should be given in large quantities and a fluid chart kept

in order to see that the child gets at least 50 per cent more fluid than that taken by the normal, healthy child of the same age.

These liquids dilute and carry away the toxins through the kidneys. As during the temperature period much more food is being burnt up, this can be best supplied by adding carbohydrates to the fluids in the form of sugar. This keeps up the supply of sugar in the blood and prevents the development of an acute acidosis. The distressing symptom of abdominal distention is best regulated by enemas and stupes. The best general stimulant is the intravenous injection of a 5 per cent glucose in normal salt solution. This acts also as a food. In toxic cases, the general use of hypodermic stimulation is usually ordered, but in my own experience it does not usually affect the outcome.

6. **Asthma** is a distressing disease which is frequently seen in children as in adults. It is characterized by recurrent attacks of severe spasmodic dyspnœa associated with a bronchitis. There is practically no difference between the asthma seen in older children and in adults. Asthma may begin in very early infancy though it is more frequent after the fifth year.

We know that certain things are predisposing factors in bringing on attacks of asthma. Unfavorable climatic conditions, exposure to winds or dust will irritate the mucous membrane of the nasal passages and pharynx, already susceptible to infections, and bring on paroxysms. Heredity plays a part in the appearance of asthma. The family history of the patient generally reveals asthma, hay-fever, eczema, urticaria, gout or some food idiosyncrasy. There is some connection between asthma and anaphylaxis, the latter being an increased susceptibility to an infection or to the action of any foreign protein introduced into the body, following a primary infection.

Chandler Walker, who has done a great deal of experimental work on bronchial asthma, classifies patients according to whether they are sensitive to proteins or not and also as to whether the attacks are seasonal or occur throughout the year. He believes bacteria are the causative agents when asthma is not associated with sensitiveness to proteins. When the patient is sensitive to protein at a particular season of the year, the pollen of some weed or flower is probably responsible for the attacks. Attacks which occur regardless of the season he ascribes to emanations from animals, to a food idiosyncrasy or to bacteria. It is now possible to ascertain which protein is responsible for the attack by means of a simple skin test.

The flexor surface of the child's forearm is preferable for skin tests (Fig. 99). This surface should first be washed with soap and water and then with alcohol. An abrasion, such as is made

Fig. 99.—Cutaneous hypersensitization due to food proteins. Positive ones outlined with pencil. Negative ones black dots.

for a von Pirquet tuberculin test, that is a small cut one-eighth inch in length but not deep enough to draw blood, is made. A von Pirquet scarifier or even a toothpick may be used for this. Place on the scarified area a small amount of the protein powder (about the size of a pinhead) and apply a drop of N/10 or N/50 (depending on how sensitive the child's skin is) sodium hydroxide solution to dissolve the protein and rub into the abrasion. Another similar cut or abrasion is made as a control and only the sodium hydroxide solution is applied. Allow to stand from fifteen to thirty minutes, wash off the powder with N/50 solution and read the results. If the reaction is positive, a raised white area or an urticarial wheel at least ·5 cm. in diameter surrounds the abrasion.

The proteins usually tested out in this way are such common foods as eggs, milk, various meats, cereals, vegetables, as well as horse dander, cat hair, feathers, pollen from grasses found in neighborhood of patient and such bacterial organisms as streptococcus, staphylococcus and pneumococcus.

The symptoms of asthma during early childhood and infancy are usually those of an acute bronchitis together with paroxysmal sneezing and some wheezing. Often the breathing is so hard and there is so much dyspnœa and even cyanosis and prostration that a more serious condition is suspected at the time of the first attack. However, the fact that these severe symptoms usually disappear in a day or two and recur at more or less regular intervals, makes the diagnosis of asthma positive.

The prognosis in asthma depends on the age of the child, the predisposing causes and the stage at which treatment is started. If proper treatment is started before damage has been done to the lungs and heart, the chances for recovery before puberty are good. However, at best, asthma is a most obstinate disease.

Treatment for asthma must not only include symptomatic therapy but attention to the hygiene and diet of the child and the clearing up of any associated pathological conditions. Building up the resistance of the child is of prime importance. The removal of diseased tonsils and adenoids, while seldom known to clear up the asthmatic condition, assist in bringing up the child's resistance. Change of climate has often proved effective in lessening the asthmatic attacks and generally improves the child's general health. However, asthmatics often have climatic idiosyncrasies as well as food ones. Some children do well in the mountains, others show more improvement on the coast, and care should be taken not to select or to keep the child in a locality which aggravates the condition.

Diet is an important element in treatment. It should be sen-

sibly regulated so that the child is not getting too much of certain foods such as meat or sweets. Certain types of food which are known to upset the child should, of course, be omitted. Protein tests may show that certain other foods not heretofore suspected excite attacks of asthma and these assuredly must not be a part of the child's diet.

Medication serves two purposes in asthma. It may ward off or lessen an attack if started early or in an acute attack it may bring relief from severe symptoms. Starting the "croup kettle" with benzoin or eucalyptus inhalations as soon as the child begins to wheeze assists. Atropin administered hypodermically or by mouth occasionally wards off an attack. Adrenalin also used hypodermically often relieves acute symptoms. Occasionally a paroxysm will be so acute that morphine is required. Mustard baths in asthma as in all the respiratory diseases have a definite place. It is worth emphasizing that no household should be without the ingredients of a mustard bath.

Vaccine treatment in asthma is still more or less in the experimental stage. I have had good results with this treatment where combined with proper hygienic and dietetic measures. When the skin tests have been positive to the protein of any food, these should, if possible, be omitted from the diet. Eggs and milk are often the exciting cause of attacks and as they are both important elements in a child's diet, desensitization of the patients to these foods should be undertaken. When pathogenic micro-organisms seem to be at fault, the injection of graduated doses of an autogenous vaccine has been tried with very good results in a number of patients. One course of injections is seldom sufficient either to desensitize the patient or to immunize him against the particular bacteria involved. Desensitization or vaccine treatment, while they promise a measure of relief, require a great deal of patience and perseverance and one cannot be sure of a cure for many months even when accompanied by the best environment and regimen.

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CHAPTER V

DISEASES OF THE CARDIAC SYSTEM

Introduction. For many years a "damaged heart" in either child or adult has been looked upon pessimistically and as a result of this feeling of finality the whole subject of heart conditions did not receive the attention it should have. Today we find a well-established system of "finding out" about all heart conditions in the cardiac clinics established in most of the large cities. It has been stated that more people attend the cardiac clinics in New York City than the tuberculosis clinics, showing the widespread recognition of the value of early detection of these conditions, and the possibility of affecting the development of heart conditions by adequate care of acute conditions. There is now a national cardiac association for the study of heart conditions and for the standardization of methods of handling these conditions. Many schools have classes for the cardiac cases. The whole trend in the care of cardiac conditions is not to minimize their seriousness but to clearly recognize every condition of cardiac disease as early as possible, and by expert care to limit the damage done, to entirely correct it if possible, and to stabilize the care of chronic hearts so that these cases may live useful and happy lives.

The social aspects of the care of heart conditions are of most vital significance as environment plays such a large part in the care of these conditions. A child with a definite heart lesion is not going to improve if he continues to live on the sixth floor of a crowded tenement, nor is the child in the most luxurious home going to do well, if rest and quiet play cannot be insisted upon. Early recognition and constant medical and social supervision are the most important factors affecting cardiac conditions.

Section I. Normal Heart Development

The heart and circulatory system develop very rapidly during infancy and childhood. The pulse rate varies from very slight causes and the rate is often irregular and arhythmic without meaning any serious disturbance. For this reason the observation of the pulse rate and rhythm should be made with the child as quiet as possible.

Normal pulse rate	6 to 12 months	110 to 120 per minute
Normal pulse rate	2 years	100 to 110 per minute
Normal pulse rate	2 to 5 years	90 to 100 per minute
Normal pulse rate	6 to 10 years	80 to 90 per minute
Normal pulse rate	11 to 14 years	75 to 85 per minute

A rate of 180 during a slight infection may not mean any more than the pulse of 120 in an adult.

The rapid growth of the heart is illustrated by the following table:

Average weight of heart	Birth	14 grams
(Very rapid growth during first 3 years)	1 year	35 grams
	2 years	53 grams
	3 years	64 grams
From 3 to 10 years, slow	7 years	80 grams
From 10 to 15 years, rapid	14 years	166 grams
	Adult	241 grams

The blood pressure also varies greatly, being quite low during infancy due to the relatively small heart and great surface of the blood vessels.

Under six months, the blood pressure is from	60 to 90 m.m. of mercury
From 2 to 3 years, the blood pressure is from	80 to 95 m.m. of mercury
From 5 to 6 years, the blood pressure is	100 m.m. of mercury
From 9 to 10 years, the blood pressure is	110 m.m. of mercury

The position of the heart during infancy is considerably higher in the chest and is placed more horizontally. For this reason the apex beat is seen outside the nipple line during infancy and early childhood. After the seventh to the ninth year, the apex is usually found inside the nipple line in the fifth intercostal space. The cardiac impulse is both more easily seen and felt in infancy, due to the greater elasticity and flexibility of the chest wall. For this reason chest deformities, i.e., precordial bulging, asymmetry of the chest, are easily developed in cardiac disease.

Cardiac disease in infancy and childhood causes a general retardation in the growth and development of all the organs. The caliber of the arteries is relatively large in comparison to the volume of the heart. The capillary circulation is much more highly developed, while the veins are, on the whole, smaller. These facts probably are connected with growth factors, as they disappear during late adolescence. The round of complete circulation in the newborn is made in twelve seconds, at three years in fifteen seconds, at fourteen years in eighteen seconds, and in the adult in twenty-two seconds. Cardiac disorders may be divided into congenital, acquired and functional.

2. **Congenital disorders** are usually definitely noted during

the first few days of life. They may not, however, become so noticeable as to be detected by simple observation until the child gets to be active. In rare instances, congenital lesions have shown first as late as the third or fourth year. Any lesion first found after the fifth year is in all probability an acquired lesion. The most pronounced symptom of a congenital heart is cyanosis. The blue baby is the typical baby with congenital heart. The cyanosis may vary anywhere from the slightest tinge of blueness about the lips at crying or when in activity, to the extreme dusky, blue black color of lips and cheeks, and congestion of the eyes. The cyanosis may spread all over the body and is especially apt to be permanent in the ears, finger tips and toes. If such children live, they are likely to develop clubbed fingers and toes (Figs. 100–101). Over the cardiac area there may or may not be evidence of bulging and pulsation but usually both are present as the heart is enlarged. A thrill can be felt usually anywhere over the heart but more definitely over the base of the heart. The enlargement of the heart in congenital conditions is usually to the right, whereas in the acquired heart conditions, the enlargement is to the left. The murmurs, their meaning and cause, are often very difficult to explain.

Congenital cardiac conditions may be caused by one of three conditions. First, the persistence of fetal conditions. Such anomalies are not uncommon. For instance the opening between the ventricles or auricles may persist after birth. The most common is the patent foramen ovale, or the connection between the aorta and pulmonary artery may persist in the form of the ductus arteriosis. The second type is due to abnormalities caused by interference with normal development. The most common of these are the defects in the septum, more often the ventricular septum or stenosis of the aurifice of one of the great vessels, most often the pulmonary. Infrequently, there may be a malformation of one of the great vessels. The third type is due to fetal endocarditis. The lesions affect the valves as in acquired endocarditis. In this condition the valves on the right side are more often involved whereas in acquired endocarditis the valves on the left side are more often involved. The extreme cases of congenital cardiac disease generally die early and most of these cases show stenosis of the pulmonary artery or some marked malformation of the great vessels. The cases that live the longest and show the least signs are those in which the lesions are very small or lesions which do not interfere with the general circulation such as *patent foramen ovale*. The most distressing cases are those where the lesions have not been quite severe enough to have killed the child during infancy,

FIG. 100.—Congenital cardiac condition showing typical congested face and club fingers.

and which grow progressively worse as the child grows older. These children are usually small and underdeveloped, presenting a picture of infantilism. As they grow older, their hearts do not keep up the normal rapid growth and the children become more and more incapacitated. These children usually die before maturity of either an intercurrent infection or directly from an incompensating heart.

The prognosis in all congenital cardiac conditions depends on the lesions. The outlook for any congenital cardiac case that shows definite symptoms is rather dubious. The cases which live and enjoy apparently perfect health are rare but such cases

Fig. 101.—Congenital cardiac condition. Club fingers.

have been reported. In a few cases, with minor lesions, symptoms found during early childhood gradually disappear.

There is no specific or curative treatment. Babies with congenital cardiac conditions should be more carefully protected against gastro-intestinal disturbances and infections, especially are infections of the respiratory tract fatal. Often by great protective care these children can be nursed through the first few years, but the majority of the cases die during childhood. These children should be interested early in entertaining themselves quietly, as sudden death can come from overexertion.

3. **Acquired cardiac diseases** are due in the majority of cases to rheumatic fever or infections. Rheumatic infections in childhood assumes an entirely different course than the usual

course of the fever in young adult life. The joint symptoms of rheumatic fever are far more frequent in young adults. The usual case is ushered in by acute pain and swelling of several joints. These are the manifestations that have given the disease its name, but in infancy and early childhood joint symptoms are extremely rare. As a child gets older, joint symptoms in the form of vague pains, become more frequent and at eleven or twelve years of age joint symptoms increase in both severity and number of joints affected. The early symptoms are far more often associated with involvement of the heart and chorea. Chorea is as common a symptom of rheumatic fever in the child as the joint symptoms in the adult. The form of the chorea may vary from slightly involuntary movements and excessive nervousness to the typical condition popularly known as St. Vitus' Dance where muscular voluntary control of movements is almost impossible.

The cardiac involvement in rheumatic fever usually starts with a slight involvement of the mitral valves, i.e., the valves on the left side of the heart between the left auricle and the left ventricle. As in any type of endocarditis, the valves are inflamed and the edges roughened by what are known as vegetations. As the condition continues, there is dilatation of the left side of the heart which results in the lesion which is usually first noted in the form of a leakage at the mitral valve. This is known as mitral insufficiency with cardiac dilatation (Fig. 102). The next step in the cardiac process is a hardening and permanent thickening of the valves and of the heart muscle itself. If this cardiac process is very acute or continues over a long period, other valves are involved beginning with the aoritc. The valves on the right side of the heart are rarely affected; though the muscle hypertrophy may extend to the right side, it is more marked on the left. The more valves infected the larger the heart becomes, passing through the same steps of dilatation and hypertrophy. The largest hearts are found in connection with aortic lesions. The complete picture of this cardiac condition as given usually means repeated acute or sub-acute attacks. These attacks usually begin with a slight upper respiratory tract infection, often a very mild tonsillitis. Sometimes this tonsillar infection is more chronic than acute, and so insidious that no definite date of the actual beginning of the cardiac infection can be determined. The mother usually notices first that the child is less active, gradually becomes pale and anemic with loss of appetite but the child may have no definite feeling of any particular ailment. He is just, as we say, without any pep. The mother is first alarmed by the child's getting out of breath

when going up stairs or walking fast or running. With this breathlessness, often a disturbing pallor of skin comes with a slight blueness of the lips. At this period of rather definite symptoms, a physical examination will show the beginning of a heart involvement. For this reason, periodic examinations of children are of great importance in detecting these conditions when there is still time to prevent actual lesions taking place. Cardiac clinics have fully demonstrated the importance of this. Eustes, in an early report on the value of a cardiac clinic in an

Fig. 102.—Decompensation of heart with generalized edema and ascites.

out-patient department, states that only 12 per cent of a small series of cases he had followed, had permanent cardiac damage, 13 per cent he put in a suspicious class, while 75 per cent came through without any acute endocarditis. Such results mean the supervision of suspected cases early and this can only be accomplished by watching every case of tonsillitis and chorea, in order to avoid cardiac infection.

Hospital wards show usually the incapacitated hearts, but the cardiac clinics show the hearts before any damage has been

done by the rheumatic infection, as about 87 per cent of such cases in the wards have permanently damaged hearts, while the clinics' record of damaged hearts is but 25 per cent (Fig. 103).

In childhood rhemuatic infections, therefore, may be considered as represented by the complex tonsillitis, chorea and endocarditis, with which is usually associated the involvement

Fig. 103.—Rheumatic nodules.

of the heart muscles or myocarditis. Many studies have been made in order to determine the etiology of rheumatic fever. The bulk of the evidence points toward the streptococci as being the cause. We are sure that some one of the streptococcus family are always found in connection with either joint, chorea, heart or tonsillar involvement. So far, no one specific strepto-

coccus has been proved the positive cause of rheumatic fever. There is a form of malignant endocarditis which is caused by a specific type of streptococcus. This may always be isolated from the blood and is fatal, which differentiates it always from the ordinary endocarditis associated with rheumatic fever.

Other types of acquired cardiac disease may accompany any infectious disease such as the myocarditis associated with diphtheria, or the malignant endocarditis at times associated with scarlet fever. But cardiac involvements other than those of rheumatic fever origin represent only about 7 per cent of the total of acquired cardiac diseases.

Treatment of these acquired cardiac diseases must be based upon an intelligent appreciation of the whole circulatory system. With the consideration of the valves there has grown up a consideration of the heart, as an automatic organism with a nervous control which is self-acting and self-starting, and with a muscle which carries out these nervous impulses. The older emphasis was almost entirely upon the valves. Now the heart is considered as possessing several functions, first, contractility, second, rythmicity, third, excitability, fourth, conductivity, and fifth, tonicity. Physiological studies of the heart have shown that the cardiac nerves (the vagus, stimulation of which slows the heart, and accelerans, stimulation of which increases the heart rate) are not directed to the heart as a whole but exercise a controlling influence on each of the five functions of the cardiac muscular tissue. The chief factor in the maintenance of an effective heart action is a regular ventricular beat. The effect of any disease upon the heart muscle is to be estimated by the extent to which the ventricular beat is affected, in other words, the *driving power* of the left ventricle. An estimate of this driving power is most important in relation to treatment. The subjective symptoms of the child must be closely observed in order to estimate the efficiency of the heart. Sometimes the child is old enough to help in making these observations by being able to tell whether he is dizzy, or feels pain or oppression in the heart region. Shortness of breath, vertigo with extreme pallor, cyanosis and vasomotor disturbances which often produce faintness and sweating are symptoms to be noted carefully. Clinically we estimate a great deal about the heart by the rate and rhythm of the pulse. In infancy and childhood the heart beats more rapidly in order to meet the demands of the growing organisms. During almost all infections, there is an increase in the pulse rate, just as there is an increase in temperature. This increase is not usually important unless it continues for a long period at a rate of say, 80 per cent above the normal. Such

an increase will sooner or later wear out the heart muscle and a damaged heart has less "reserve power" than a normal heart, and less "rest power" or power to recuperate. This makes the care of the damaged heart during infections of great importance, and the avoidance of infections to be accomplished if possible for the child with a damaged heart. Both this "reserve power" and "rest power" can be estimated by certain functional tests, such as a certain set exercise will increase the pulse in a normal child 20 beats per minute and will take from one to three minutes for a pulse to return to normal depending upon the strenuousness of the set exercise. In a damaged heart the reactions from a set exercise are a greater increase in the heart rate and a much longer period for the heart beat to come back to where it was before the exercise was taken. The three minute outside limit of the normal child sometimes extends to fifteen minutes or a half hour for the child with the damaged heart. This may be expressed graphically by saying that the normal heart rate rises rapidly and returns to normal rapidly, whereas the damaged heart rises rapidly, maintains the altitude a longer time and takes a longer, slower course, returning to the starting point. Besides these functional tests and the subjective symptoms of the patient, there have been developed very accurate instruments such as the polygraph and electro cardiogram which give us an accurate estimation of the rate and rhythm of the heart and the nervous control. The sphygmograph gives the systolic and diastolic estimates of blood pressure. But Sir Thomas Lewis says he would rather observe how a patient sits down in a chair and gets up out of a chair for a month than use any of these finer instruments.

These principles form the basis of the treatment. During the acute stage and as long as there is temperature, absolute rest in bed is demanded. At first this is rather easily carried out, but as the period lengthens, rest in bed is the most difficult to enforce. After the temperature has ceased, it is always a question how long rest in bed should continue. Ordinary periods vary from two weeks to three months and physicians differ as to the necessary periods of rest. My own experience has been that the longer quiet can be enforced the better for the condition, and six weeks is none too long. During this period, massage followed by passive and then by active exercises in bed are the best methods to keep up the child's general tone and to prepare the child for getting back to normal activity. If these methods are carefully and intelligently carried out it is remarkable to see how the muscle tone of the child improves. At the end of such convalescent care, we have a child with good muscle tone instead

of a weak flabby musculature. This, of course, means that the heart muscles benefit also and are in better condition to take up the normal life.

This rest period is a great tax upon the nurse's ingenuity as well as upon the resources of the whole family. Bedside games, and occupations which interest the child quietly, are a great help in keeping the patient happy and contented. Little children cut out dolls, paste scrap books, string gay beads; older children have been taught to do very good work in wood carving, painting, weaving, making baskets and many other types of occupational therapy. To keep the children happy is a big factor in the fight. The diet and hygiene of the child are important during the whole period. To control the home environment is often difficult but is always of great importance. In the real cardiac cripple his social and occupational activities must be most carefully worked out.

The drug treatment is not specific. Salicylates are given during the temperature period especially if there are joint symptoms. Where joints are involved, rest and local applications are, of course, indicated and afford great relief. For chorea, the standard drug is arsenic in the form of Fowler's solution. Some physicians claim very good results from the use of Fowler's solution. Other physicians report the contrary. My own experience lies half way between—in some cases I have had good results, in other cases none. Hot baths or packs will sometimes quiet the child when nothing else will. Marked cases of chorea are better off in a quiet darkened room. The chief drug used for the cardiac conditions is digitalis. The action of this drug is to slow and regulate the heart. When temperature is present, digitalis is usually not effective, but may be very effective in the convalescent period. In permanently damaged hearts the use of digitalis is more or less constant.

The complications most frequently met in acquired cardiac conditions are *first,* acute or sub-acute disturbances of the gastro-intestinal tract. When vomiting occurs it is always a serious complication because vomiting makes it harder to keep up the nutrition of the child, the loss of water increases the chances of acute intoxication and affects the blood volume, and makes the heart action more difficult. *Second,* respiratory infections, such as bronchitis or pneumonia seriously embarrass the heart. During the acute dilatation of the heart, pulmonary edema is usually the final complication. *Third* (Figs. 104–105), pericarditis is probably present to a slight degree in a great many of the acute cardiac involvements and accounts for the common symptoms of precardial pain. But when pericarditis can really

be demonstrated by the presence of a friction rub or by the presence of fluid in the pericardium, the complication is a truly serious one. Mortality statistics show that pericarditis increases the mortality by at least 50 per cent. The fluid may be either serous or purulent. The serous type of fluid is the most common. It may be present in small quantities or in large quantities which

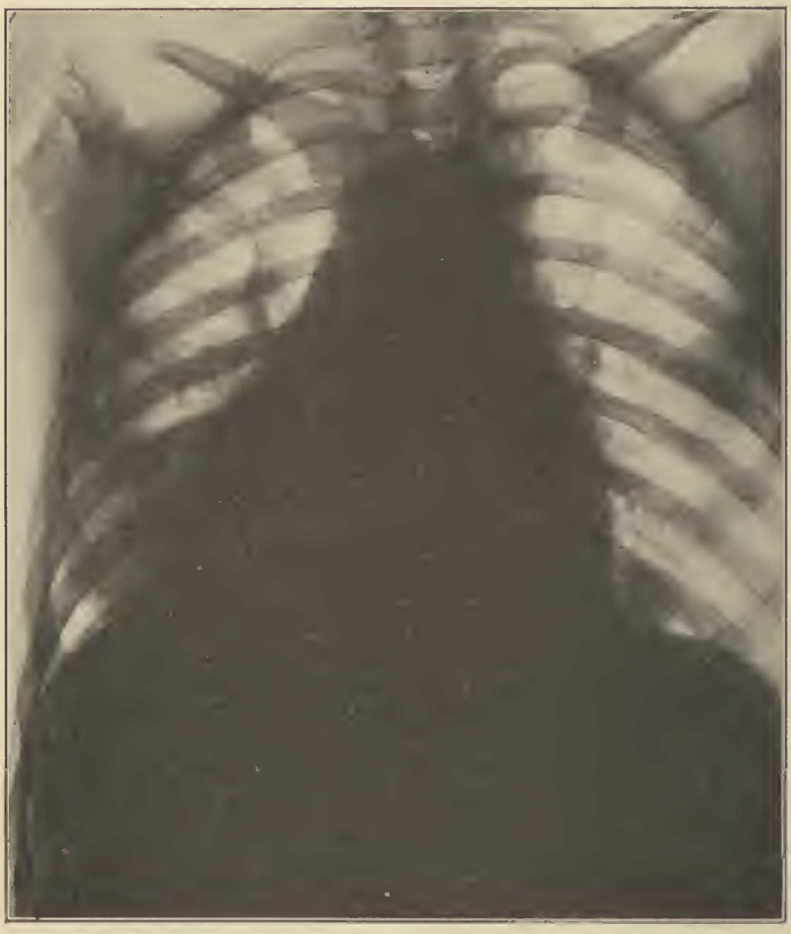

Fig. 104.—X-ray showing pericardial effusion.

may be drawn off. In the majority of cases, however, natural absorption of the fluid takes place. If the case lives through an acute pericarditis, adhesions between the two layers of the pericardium or adhesions to the diaphragm so increase the work of the heart that the end result is an added handicap which necessitates still further limitations of the child's activities.

The outstanding feature of rheumatic fever is its tendency to recur and avoidance of recurrent infections must be carefully guarded against. Diseased tonsils and adenoids should be removed, teeth should be kept in condition, as it is by these routes that infections usually enter the system.

4. The third type of cardiac conditions are functional. These functional conditions are various. There is the heart that tends

FIG. 105.—X-ray of normal heart.

to have a more rapid beat than normal, the kind of a heart met among malnourished children who are easily fatigued and nervous and who possess poor muscle tone. This poor muscle tone is the cause of the hemic murmur which is usually found in these functional heart cases.

There is also the heart following various ailments and infections which shows these same symptoms, partly due to anemia

and the atonic condition of the muscles. When such conditions are corrected, the functional symptoms disappear. The management of these functional hearts depends upon correcting the original cause of the condition. Rest, diet and hygiene are important. Functional heart conditions are not always easy to determine as it is impossible at times to draw a definite line between the functional case and the beginning of an organic case. As the organic cases are so serious, the supervision and treatment of these functional cases must be as carefully executed as though we were treating the beginning organic case because the only way we know that the case is not organic is by the clearing up of all the functional symptoms.

Massage and Exercises for Convalescent Stage of Cardiac Disease (routine used in University of California Hospital).

First Stage. Light massage (no tapotement) for 10 minutes twice daily. Arms and legs only at first, then abdomen and back.

Second Stage. Medium massage starting with arms and legs and increasing as in first stage. Breathing with passive arm movements five times. Gradually add:

1. Active knee flexion and extension.
2. Active leg abduction and adduction.
3. Ankle exercises.

Each of above exercises to be done three times. Entire exercise to last twenty to thirty minutes once daily.

Third Stage. Medium to heavy massage, arms, legs, abdomen, back. Resistant exercises to arms and legs with deep breathing five times for each extremity. Active arm movements with pulley three to five times, using forward, lateral and upward extension and flexion. Weight to be pulled.

Fourth Stage. Medium, heavy massage. Pulley exercises arms and legs. Weight gradually increased. Each exercise to be done five times, increasing gradually to ten times. Breathing exercises to be combined with pulley exercises. *To start standing.*

Fifth Stage. To stop massage. Active gymnastics with breathing exercises. Pulley work.

Twice a week, pulse, respiration and systolic blood pressure to be taken before exercise, immediately after and again in two and fifteen minutes. If the child seems to be over-tired or in any way reacts badly, a special record of pulse, respiration and blood pressure should be made with a description of symptoms. If a case progresses well, each stage will last a week. If for some reason a stage should continue for a longer interval, special orders will be given.

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CHAPTER VI

BLOOD CONDITIONS IN INFANCY AND CHILDHOOD

Blood is very often considered just a fluid with various types of cells, white and red, floating in it. But blood is so much more than this that a study of some of the functions the blood carries on as a tissue is a good beginning for our consideration of blood disturbances. The word tissue does not seem to have any relation to blood because we ordinarily conceive of tissue as a semisolid substance one can hold between the fingers. In reality blood carries on more functions than most tissues. Food which has been prepared by the tissues is carried by the blood from one organ to another. Blood carries away from these tissues the waste products, to the kidneys and the skin; blood carries the oxygen from the lungs to all the tissues and takes off the carbon dioxide which is given off by all the cells in the body. Blood carries the internal secretions from the internal glands to whatever part of the body stands in need of the secretions. Blood fluid contains the right proportion of the various salts so that the right osmotic pressure between the various cells is maintained. The white cells of the blood are the great offensive organs of the body against infection. The normal volume of the blood is in itself an important factor in the internal activity of the organs and cells. When the blood volume is reduced to much below one-half, all the functions of the body suffer and there is always a constant effort on the part of the body to keep up the normal blood volume. If much blood is lost the body will immediately replace this by taking fluid from the other tissues and any continued disturbance in blood volume is most disastrous.

The tissues which form the blood cells are produced by the red bone marrow, by the spleen and by the lymphatic system. The blood tissue itself is composed of the blood serum with its protein part, sugar and salts and that complex substance which enters into the coagulation of blood. Besides this fluid substance, the blood contains three types of cells, the red cells, white cells and the platelets. These platelets also take an active part in the coagulation of the blood. The number of red cells varies. At the time of birth they may be as high as five and one-half to

seven million cells per cubic millimeter. Within a few weeks this drops rapidly to less than five million, often as low as four million, and usually remains under five million during all of infancy and childhood. Five million is the average adult count. The percentage of hemoglobin is also high during the first few weeks of life, often being above 100 per cent. This is due to the fact that there are more red cells in circulation. This percentage of hemoglobin drops and remains between 80 and 95 per cent during the remainder of infancy and childhood. In the beginning the leucocytes are also increased, varying from 15,000 to 20,000, and gradually drop to about 10,000 and varies between 10,000 and 15,000 during infancy and early childhood. In the beginning the polymorphonuclear forms of cells predominate. These are the cells that are chiefly concerned with combating acute infections. Gradually the lymphocytes increase to a greater number than the polymorphonuclears and remain so, as the characteristic findings of the white cells during infancy and early childhood. The type of white cell varies under different conditions and the picture which this variation presents is called the differential count. In acute infections such as pneumonia, scarlet fever, tonsillitis and other infections due to pyogenic bacteria, polynuclear cells increase (leucocytosis), whereas in such infections as tuberculosis, measles, malaria and typhoid, there is a decrease in the number of cells (leucopenia) and the lymphocytes often predominate. In certain other infections the eosinophils increase (Eosinophilia). Parasite infections, often asthma, and other conditions due to protein sensitization, cause this increase. The number of platelets averages somewhere between 250,000 and 500,000 per cubic millimeter. When the platelets drop below 50,000, hemorrhagic conditions usually result. The following table summarizes these averages.

	First Weeks	Infancy and Childhood
Red Blood Cells (R. B. C.).....	5 to 7 million	4 to 4½ million
Hemoglobin (Hg)..............	120 to 100 per cent	80 to 95 per cent
White Blood Cells (W. B. C.)...	20,000 to 15,000	10,000 to 15,000

DIFFERENTIAL COUNT

(a) Polymorphonuclears..............................	35 to 45 per cent
(b) Small mononuclears or lymphocytes................	40 to 50 per cent
(c) Large mononuclears..............................	10 per cent
(d) Eosinophils......................................	1 to 5 per cent

Platelets count from 250,000 to 500,000.

2. **Anemias.** Anemia is a condition met frequently during infancy and childhood. There are two types, primary and sec-

ondary, and the secondary anemia is the type most frequently met. Secondary anemia follows many conditions. It may be the result of a simple intestinal infection or it may be very severe in form following an acute infection. The severe secondary anemias have a hemoglobin below 50 per cent and a reduction in reds to three million or less. When the hemoglobin is reduced to 25 or 30 per cent, life is endangered. Fortunately, the recuperative powers of the bloodforming organs are very good during infancy and childhood. The danger, of course, from secondary anemia is due to the fact that the cells of the body are being poorly supplied with oxygen and the normal processes of these cells are carried on with great difficulty.

The treatment of secondary anemia lies first, in the consideration of the primary cause of the condition and correcting that, and second, in the direct treatment of the anemia itself. The regimen of the child's life, the diet, fresh air and sunlight, are the most important part of the treatment. It has been conclusively shown that certain dietary ingredients directly stimulate blood forming organs, such as spinach, liver, red meats, beef juice. Most high carbohydrate foods such as cereals and breads and sugar do not. Direct sunlight has a very stimulating effect on the bloodforming organs. Iron is the drug that clinically has been shown to have the most effect. This can be given by mouth, in simple cases, and by hypodermic injections in severe cases. Often all that is needed is a tonic to increase the appetite. Some cases of secondary anemia are inclined to last a long time but most of them respond to good general hygienic care. In a few severe cases, transfusion of blood is necessary and may be the only way in which the bloodforming organs may be stimulated. Transfusion of small quantities of blood repeated from time to time are often more effective than single large quantities of blood (Fig. 106).

Primary Anemias. All types of primary anemias have been reported in infancy and childhood. The most characteristic type is known as infantile splenic anemia (Von Jaksch). This anemia is considered by some to be a secondary anemia, by others a primary. It is one of the anemias with enlargement of the spleen from which children, if properly treated, recover completely. The changes in the blood are very characteristic. There is a decrease in the number of red cells of from two and one-half to three million. There is considerable variation in the size of the red blood cells and nucleated red blood cells also appear. The decrease in hemoglobin corresponds to the decrease in the red cells. The white cells or leucocytes are moderately increased from 20,000 to 60,000. Most of these are polynuclears.

The symptoms begin gradually, at first may be somewhat indefinite. A loss in weight and pallor of skin may be all that is noticed. The spleen is very large, often filling the left side of the abdomen and extending down to the pelvis. The liver is enlarged, but not to the same extent as the spleen. This condition of splenic anemia usually occurs between the sixth month and the third year. There are usually no signs of infection, such as temperature. If the condition continues and hemorrhages appear, the prognosis is more dubious. In the earlier stages the cases respond to improved hygiene and diet. Arsenic in the form of Fowler's solution and iron are the two drugs most often

FIG. 106.—Puncture of longitudinal sinus.

used. Opinions differ as to the efficacy of either of these drugs. If there is any question of syphilis, this should be investigated and, if present, actively treated. Both X-ray and radium have been used but as yet there is not sufficient data to show whether the use of either of these methods is the best treatment in this type of anemia.

Banti's Disease. This is a condition which starts in childhood and extends into adult life, as the course of the disease may last many years. It may make its appearance at any time but not as early as the splenic anemia of infancy. Sometimes it does not appear until early adult life. The characteristic feature is the very marked enlargement of the spleen which is hard but not painful. In the later stages of Banti's Disease there is a

tendency for the liver to enlarge and jaundice to appear. The anemia may be quite marked, the hemoglobin going down as low as 30 to 40 per cent. The number of red cells does not decrease in the same relative proportion as the hemoglobin. The white cells are not increased, they may even be slightly decreased, whereas in splenic anemia they are increased.

The diagnosis in the early stages is sometimes difficult to make, especially if it occurs in the age period of splenic anemia.

If the diagnosis is made early, the removal of the spleen gives the most hope for checking the disease. If this is not done, radium and X-ray are the next best methods of treatment. The by these methods, so that the child is relieved of the discomfort disease is seldom cured, but the size of the spleen may be reduced of the splenic tumor and can lead a more normal life.

Aplastic anemia is always a fatal type of anemia and is fortunately quite rare in infancy and childhood. This disease is characterized by marked anemia, very low hemoglobin, often as low as 10 or 15 per cent, rapid reduction in the number of red cells which often drop to a few hundred thousand, a half million or less, and the white cells may be reduced often to a few hundred. The cause of the condition is unknown, but whatever causes it interferes with the bloodforming organs to such an extent that they can no longer form the blood cells. The character of the bone marrow is entirely changed, the spleen is enlarged, but not to the extent existent in the anemias already described. As the anemia progresses the child's pallor becomes a most striking feature. Generalized edema occurs due to the marked change in the blood volume or consistency. As the platelets diminish, with the other changes there is a marked tendency to bleeding. The course of aplastic anemia is often so rapid and accompanied by such high temperature of a septic character that a severe infection is sometimes suspected. There is no treatment if the condition of aplastic anemia exists as the child dies because the bloodforming organs are so seriously impaired that recovery is impossible. But transfusions of blood have been known to prolong life (Fig. 107).

Chlorosis. The condition of chlorosis is one found in rapidly growing adolescent children, mainly in girls. It used to be called the "green" sickness because of the peculiar pallor. The girl usually complains of fatigue, breathlessness and palpitation. They may be drowsy or very nervous and irritable.

The characteristic change in the blood is the marked reduction of hemoglobin without a marked reduction in the red cells, i.e., the hemoglobin may be as low as 20 or 30 per cent but the red

cells will be between three and four million. The white cells are also slightly diminished.

As our girls live a more outdoor life, this condition is becoming more rare. The diet and hygiene of the girl form a most important part of the treatment. Iron seems to definitely assist in the increase in the hemoglobin.

Leukemias or Leucocythemias. Leukemia is really a malignant tumor of the while cells as there is a wild over-production of these white cells. There are two types of leukemia, depending on the kind of cells. Lymphatic leukemia is the type in which the lymphocytes predominate, often presenting 90 to 98 per cent

Fig. 107.—Method of obtaining blood from jugular vein in the neck.

of the white cell count which may be anywhere from 50,000 to 600,000 instead of the normal 10,000 to 14,000 (Fig. 108).

The myelogenous type of leukemia is the one in which the myelogenous cells predominate. These cells are true bone marrow cells and do not normally appear in the circulation but under pathological conditions may appear as an occasional finding. In myelogenous leukemia these cells may represent from 40 to 60 per cent of the total white count which often runs as high, if not higher, than in lymphatic·leukemia. In both these types of leukemia the spleen is enlarged. This may not be as striking a feature in the very acute cases as it is in the sub-acute or chronic. In the chronic cases the spleen may fill the larger part of the abdomen. The course of the acute cases is rapid, with

marked pallor, septic temperature and a tendency to bleed from any of the mucous membranes.

Digestive symptoms are often prominent and may be at first misleading. The duration in some of the acute cases may only be a matter of weeks while the sub-acute or chronic cases extend over months or even years. In the end they are always fatal.

Fig. 108.—Myelogenous leukemia with spleen outlined.

The younger the child is the more acute is the condition. The sub-acute and chronic form are found among older children. In these cases, life can often be prolonged considerably by X-ray and especially by radium treatment. I have a case under observation now where the myelogenous leukemia is associated with a congenital luetic infection and has existed from the twelfth

year to over the fourteenth year and she is leading, to all intents and purposes, a fairly normal life. She is going to school and enjoying much in life. This has been made possible by periodic anti-luetic treatments and radium treatment. But even with such apparent results, no absolute cures of the condition have been made in childhood.

Hodgkin's Disease or Pseudo Leukemia. This condition is comparatively rare in childhood but when found it is characterized by a general enlargement of the lymphatic glands. The spleen and liver are also enlarged.

The cause of the condition is unknown though some consider that the condition is due to a particular type of organism. The symptoms depend a good deal upon which glands have the most enlargement. If the neck and chest glands are enlarged, chiefly, the swallowing and breathing may be affected. The condition is fatal, and very little help can be gained from surgery beyond the diagnostic assistance. But much is to be hoped from radium and X-ray in checking the condition and making death less horrible.

Hemorrhagic diseases include a large group, such as hemorrhages of the newborn, the various types of purpuras, hemorrhages which occur in infections, particularly those connected with jaundice, hemorrhages which are due to drugs, such as benzol, as well as the hemorrhages which are hereditary in type and belong to the group known as *Hemophilias* (Fig. 109).

Whatever the hemorrhage, excepting those caused by mechanical means, such as cutting an artery or vein, some one of the elements entering into the coagulation of blood are affected. Detailed description of these various elements would take us into too complicated a field for our present discussion. But we can say that there are five factors concerned in coagulation: (a) the prothrombin, which is contained in great part in the platelets; (b) the anti-thrombin, (c) the thromboplastin—b and c are present in the blood or at least develop just at the time of coagulation; (d) fibrinogen, which is a liver product; (e) calcium, which is present as such in the blood.

Hemorrhagic diseases are classified according to the factors involved. Hemorrhagic conditions of the newborn may be due to defective amounts of prothrombin or to an increase in antithrombin from septicemia or to a diminished fibrinogen caused by a liver necrosis.

The purpuras which are often grouped together may have a change in any one of the five factors as the real cause. This means that the hemorrhagic conditions must be studied very carefully to find the cause, but after the discovery of the cause

we may be able to give but little assistance in treating the condition. Studies have shown that in hemophilia, the heredity type of hemorrhage, the prothrombin factor is at fault, but so far little has been accomplished in permanently correcting the condition. Almost any hemorrhagic condition may be tem-

Fig. 109.—Hemophilia showing hemorrhage into elbow joint.

porarily benefited by blood transfusion, using either whole or citrated blood.

In young infants this can be done successfully by the syringe method, using the whole blood. In older children, where larger quantities are required citrated blood must be given. It is important that the child's blood should be tested against the donor's blood before transfusion in order that it may be determined whether there are any factors in either one which will cause destruction of the red blood cells, that is, hemolysis (see Harmer,

Fig. 110.—Method of injecting into buttocks.

Fig. 111.—Method of injecting into triceps just below insertion of deltoid.

pp. 551–552). In cases of moderate hemorrhage, whole blood can be given intramuscularly (Figs. 110–111). In some cases of hemorrhage which are not severe, coagulants may be given, such as coagulin or thromboplastin. These are a combination of the coagulating factors extracted directly from the blood. They are not as potent as whole blood and therefore do not check a severe hemorrhage, but may affect a slight hemorrhage from the nose or mucous membrane. Naturally, where the hemorrhagic condition is due to a total lack of one of the normal coagulating factors in the blood, transfusion will give only temporary relief. Where the condition is due to a temporary derangement of one of the coagulating factors, it will cure the condition. An illustration of the first is hemophilia where there is a permanent diminution in the amount of prothrombin present. The second type is that found in the newborn where there is only a temporary derangement in the prothrombin factor.

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CHAPTER VII

DISEASES OF THE GENITO-URINARY SYSTEM

1. The quantity of urine passed by children varies considerably. During the first 24 hours of life the quantity varies from a few c.c.'s to about 60 c.c. By the end of the first week the amount varies from 100 c.c. to 300 c.c. By the end of the first year, the normal quantity varies from 200 c.c. to 400 c.c. From the second to fifth years, 500 c.c. to 800 c.c. From five to eight years, 600 c.c. to 1,200 c.c. From eight to fourteen years, 1,000 c.c. to 1,500 c.c.

During the first few days the urine often contains a considerable amount of uric acid crystals which leave a brick red deposit on the diapers. This usually passes away after the first few weeks. The depth of color of the urine depends upon whether it is concentrated or dilute and this depends in great part upon a number of factors; first, the quantity of liquid the child is getting. The normal water need for children of various ages is approximately

	Water or Liquid
Birth to 6 months	300 to 500 c.c.
6 months to 1 year	500 to 1,000 c.c.
2 years to 4 years	1,000 c.c.
4 years	1,100 c.c.
8 years	1,200 c.c.
12 years	1,300 c.c.

Of course, children take a lot of fluid in other forms than just plain water. The channels of water loss from the body besides the kidney are by the bowels if there is diarrhea or frequent stools, the normal amount of urine will be diminished and the urine tend to be concentrated. Water is also lost through the exchange of air in the lungs and through the skin. In the presence of temperature and increased respiration there is an increase of water loss by these routes. This accounts for the concentration of urine during most infections. The specific gravity of the urine also varies. During the first week there is a low specific gravity 1.004 to 1.010. By the end of the first year the specific gravity ranges from 1.006 to 1.012. From

the fourth to the eighth year it varies from 1.008 to 1.016. At the tenth year it varies from 1.012 to 1.021. After this time the specific gravity approximates that of an adult.

The reaction of the urine is usually slightly acid, though this depends a good deal upon the diet of the child. Shortly after urine is passed and it becomes cold, a deposit is often noted which is due to the phosphate sediments, making the urine cloudy. This often alarms the mother but by warming the urine it can be shown that this sediment disappears. The more serious constituents found in urine such as albumin and casts are not visible but must be demonstrated by laboratory, chemical or microscopical means. Blood is about the only pathological constituent that is evident to the naked eye. Blood usually makes the urine smoky though it may be in such large quantities that the fresh blood can be seen (Figs. 112–113).

Fig. 112.—Method of obtaining urine from boy baby in test tube.

(For methods of collection of urine in infants and children see Harmer, pp. 132–133. For some of the simple laboratory tests a nurse may be called upon to carry out in following cases of nephritis, see Harmer, pp. 453–454.)

2. **Nephritis in Infancy and Childhood.** Nephritis is a rather common condition in childhood especially following the various acute infections. Nephritis following scarlet fever is one of the most common types of nephritis in childhood. It is usually a degenerative type of acute nephritis, running a long course and having more of a tendency to become chronic than the form of nephritis following other infections such as tonsillitis. By some physicians, tonsillitis is considered the chief etiological factor in the production of acute nephritis. Acute nephritis may follow acute gastro-intestinal infections or certain skin infections, particularly impetigo.

Clinically the types of acute nephritis may be divided into three groups: First, those in which the secretion of urine is very small and in which edema is a marked feature. These cases are more likely to have uremia. The onset is acute with temperature and all the other symptoms of an infection. The diagnosis is easy to make from the appearance of the child and the finding of blood, large quantities of albumin and casts in the urine; the second type are those in which the urine is less than normal and there is slight or moderate edema. Sometimes the edema is only noticed by a slight puffiness under the eyes or can only be demonstrated by pitting of the skin on pressure on the foot or on the leg over the tibia. The urine does not show macroscopic blood though under the microscope

FIG. 113.—Glass water dish (used in all bird cages) arranged with adhesive straps for collecting urine from girl baby.

red blood cells are often seen, albumin and casts being present in variable quantities.

The third type are those in which there are few or no visible signs of nephritis. These cases are often spoken of as the subacute or chronic mild cases. This type of nephritis is detected by an examination of the urine which will show the presence of albumin and casts.

The prognosis in nephritis varies with the different types. Unless properly managed the nephritis following infectious diseases, especially scarlet fever, tend to have the highest mortality. Nephritis following tonsillitis usually recovers though there is a feeling among many pathologists that the chronic progressive nephritides of later life may have had their beginnings in the acute attacks of nephritis in childhood. (Chart 13.)

The course which these cases of nephritis pursues varies from

a few weeks to months or even years in the sub-acute and chronic cases. If death occurs in the acute cases, it is usually due to uremia. In the chronic conditions, death is more likely due to secondary infections from the lowered general vitality of the child. (Chart 14.)

The principles underlying the treatment of acute nephritis are first concerned with diminishing the work the kidney must do and second with methods to assist the kidney in doing its work. Unfortunately, there is little we can do to help a kidney function but we can definitely diminish the work. Regulation of the diet by removing the proteins and salts which the kidneys must secrete is a direct way of lessening the kidneys' work, the urea of the urine being chiefly derived from protein foods. For infants and young children the best diet contains cream and milk, with carbohydrates and sugars which are found in cereals and bread. By adding butter and sugar the needed calories can be very well supplied. The question of the quantity of water to be given depends upon the condition of the kidney. If the urine contains much blood and edema is present, the total quantity of liquids must be reduced to the minimum and the salts in the food must be eliminated. Salt-free diets are available for these cases by not adding salt in any of the cooking of cereals or vegetables, and washing the vegetables and draining off the water in which they were cooked. In the presence of marked edema and when uremia is feared, active purgation by cathartics and salts and active sweating by hot packs (Figs. 114–115) are to be strenuously applied. Very few drugs besides the purgatives are of any value. In the very acute cases, diuretics or the drugs given to increase the flow of urine are mainly contraindicated, on account of the inflamed condition of the kidneys. In the less acute or chronic cases they may be given. Theobromine, caffein and digitalis in the order mentioned are the drugs usually used as diuretics. By some physicians alkalies are used to increase the activities of the kidneys. In the acute cases, alkalies probably do not accomplish that end, but in the subacute and chronic cases they are very useful. The cathartics most often used are compound jalap powder, compound licorice powder and in extreme cases croton oil is occasionally helpful. Elaterine is another drug that is useful at times. The free catharsis diminishes the edema but it is not nearly as effective as diaphoresis (sweating), which is best induced by the hot packs. The only drug that will produce sweating is pilocarpin, which is rather dangerous because it is likely to cause edema of the lungs.

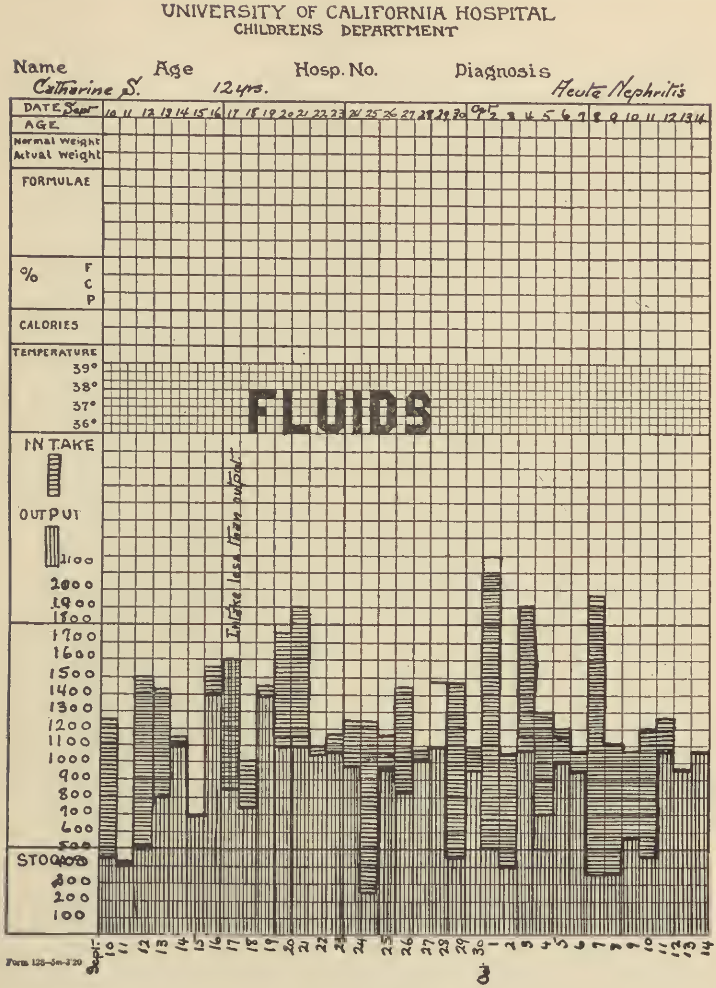

CHART 13.
Legend for
Catherine S. (Hospital No. 17102)

Age: 12 years.
Diagnosis: Acute Glomerular nephritis.

Family history negative. Had been a healthy child except for having had measles at the age of five and had her tonsils removed at the age of six following an attack of sore throat. During the past week the child lost her appetite and ran a slight temperature. She was brought into the out-patient department where her physical examination was negative except for a quite marked nasal discharge with slight swelling of the feet. The urine examination disclosed the fact that there was a great deal of albumin and blood. Her temperature on the first day of her admission into the hospital was not high though her intake of fluid was considerably higher than her output, as shown in the fluid chart. The condition of her urine,

Form 140—25m—9,'20

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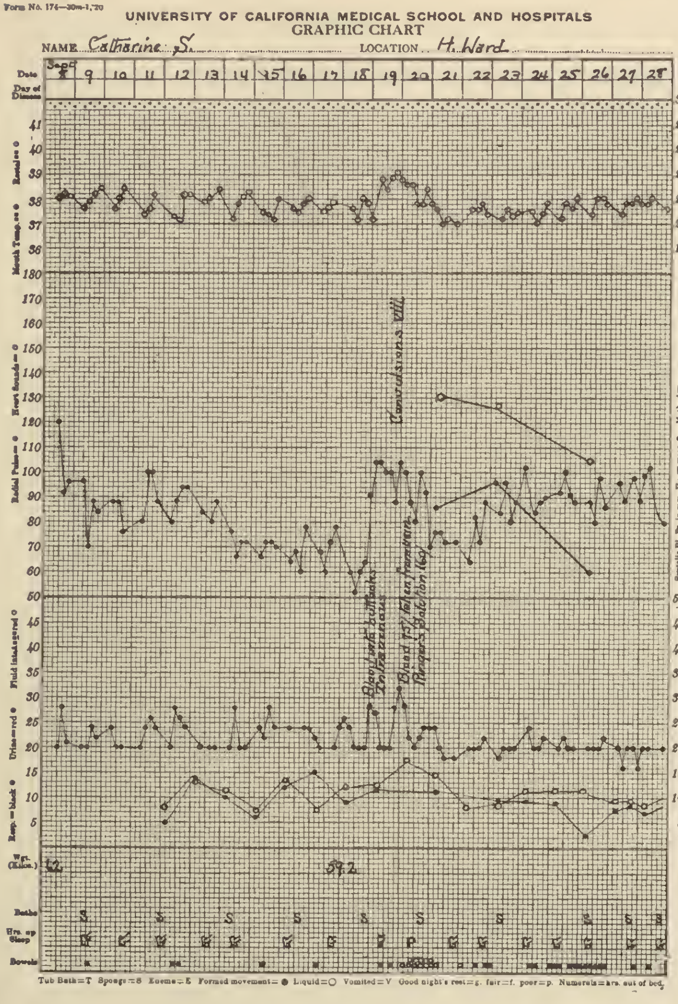
NURSE'S RECORD

Name Catharine S. 12 yrs. Location H. Ward

Hours	Temp.	Pulse	Res'n	Urine	Stool	Medicine	Nourishment	Remarks
A.M.	—	Sept.	19.	1922		—	Tuesday —	
4:00	38^{9}	120	24					Blood 10/ into
								buttocks.
5:30							5% Glucose Sol.	
							300/	Intravenously.
6:15	38^{7}							Hot pack for 15 min.
								Convulsion lasting
								about 5 min. beginning
								at head — eyes did
							H_2O 200/	not roll back.
				1300/?			1350/ ?	Gen. A.M. care.
10:30							Orange Juice c̄	
							10% Glucose 50/	Purulent nasal
								discharge.
11:00				400/?			H_2O 150/	
							10% Glucose 30/	Convulsion lasting
								20 seconds.
12:00	38^{6}	104	28			Chloroform		
P.M.	—					$NaHCO_3$ 20/	in H_2O 200/	per rectum.
12:15								Convulsion lasting
						Chloroform		40 seconds.
12:30		110				Mag. Sulph. 30/ c̄	H_2O 50/	Hot dry pack.
12:50								Convulsion lasting
								40 seconds.
1:00							H_2O 50/	Pack removed —
							10% Glucose	slight diaphoresis
1:15						Chloroform		Convulsion lasting
								20 seconds.
2:00							H_2O 100/	
							10% Glucose	Slight convulsion
2:20				140/?	E			Colonic flush — lg.
								amt. feces returned.
3.00						Chlor. Hyd. /	5	
						Na Brom /	5 in Starch H_2O	
							200/	per rectum. Retained.
4:00	38^{2}	104	26			M. Magnesia	15/ H_2O 50/	Hot pack
4:35								Convulsion — 3 min.
						Chloroform		" " " — 30 sec.
4:50		108		200		" " "		" " " 3 min.

NURSE MUST SIGN NAME TO EACH RECORD MADE.

however, did not improve rapidly and on the 17th and 18th there was apparently more blood and albumin in her urine. Both of these days she complained of headache and on the evening of the 18th she complained of double vision. On the morning of the 19th she vomited and her temperature suddenly rose to 39°C. (102.2°F.). Her eyesight became markedly blurred and at 3 a. m. the child went into a convulsion followed by coma. She had numerous convulsions that night which lasted from one to five minutes and could only be controlled by chloroform. She was put into a hot pack and was given large doses of milk of magnesia which was the only purgative which she would not vomit. Her blood pressure was very high and for this reason a venesection was done, taking out 75 cc. of blood



from a vein. As soon as the vomiting stopped she was put on compound jalap powder so that she would have numerous liquid stools a day.

After 48 hours of stuporous condition she recovered very rapidly—her temperature dropped and remained below 38°C. (100.4°F.) for the rest of her stay in the hospital. The daily nurse's chart for September 19th, the day of her convulsions, is given and will show what nursing treatment was carried out. She was in the hospital from September 8th to November 19th and on discharge was in good condition with only a very slight trace of albumin in her urine and no edema. She was referred back to the out-patient clinic to be followed up carefully.

Careful nursing and strict attention to diet, intelligent carrying out of the procedures, prevention of colds or chilling in handling the child are the most important factors in the recovery.

3. **Albuminuria** is often found in the urine under various conditions when it does not mean the presence of nephritis. During most acute infections albumin can be demonstrated in the urine. This is due partly to the congestion of the kidney and partly to the general tissue breakdown which is characteristic of a toxic infection. When albumin is found during infections, the urine should be watched carefully. Shortly after the temperature and other toxic symptoms have subsided, the albumin disappears. During the examination of children apparently normal, albumin will be found in the urine. Such cases should be studied carefully as this finding may indicate a very slight degree of nephritis, or merely what is known as orthostatic albuminuria. In such cases, if samples of day and night urines are taken, the night urine after rest in bed will not show it. The presence of albumin in such cases is usually due to some postural error or a ptosis of the kidney which is usually associated with a sagging of other abdominal organs. This produces a passive congestion of the kidneys which would be absent when the child was in bed. A marked postural lordosis produces the same congestion of the kidney with the same albumin results. At times very faint traces of albumin are found in the urine of malnourished children for which there is no evident explanation and which disappears with the condition of malnutrition.

4. **Indican** is often found in the urine from bacterial fermentation of the protein in the intestinal canal and the degree of indicanuria indicates the amount of fermentation. Normal breast-fed babies seldom show indican in the urine. Sometimes indican is present when there is well-marked constipation, and in most gastro-intestinal diseases and intestinal toxemias. The presence of indican in the urine is only pathological when it is in great excess. Obermayer's Test for indican is as follows: Add 3 c.c. of a 20 per cent solution of lead subacetate to 15 c.c. of urine, and remove the precipitate by filtering. Then add 15 c.c. of Obermayer's reagent (2 per cent solution of ferric chloride in strong hydrochloric acid) and shake the mixture. After shaking, 3 c.c. of chloroform is added, and the mixture is again shaken. Indican, if present, gives a blue color to the chloroform.

5. **Acetonuria.** This condition is found in the severe autointoxications. Diacetic acid and acetone are formed from oxy-

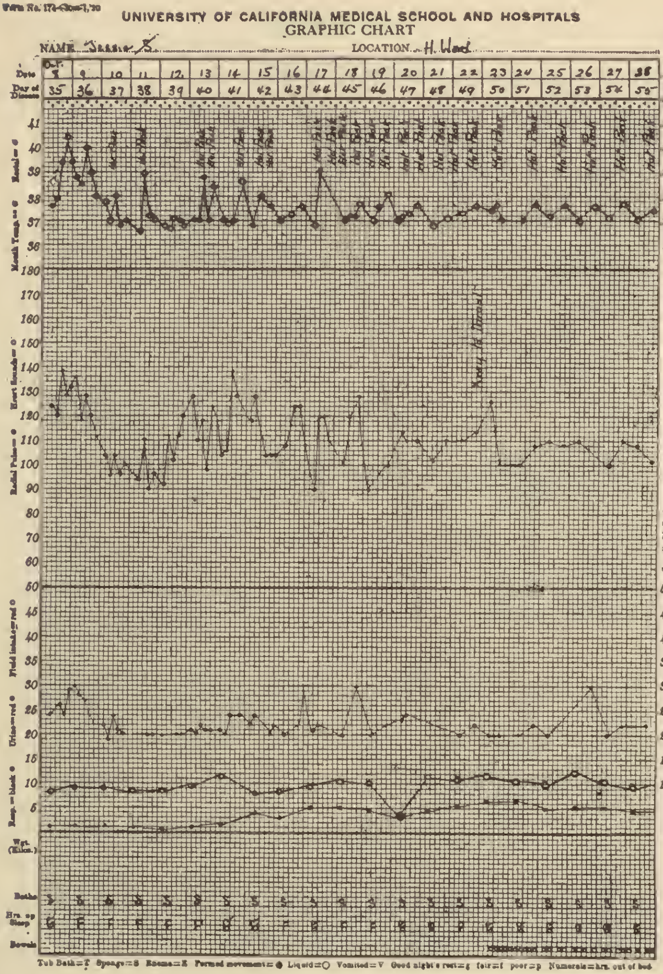


CHART 14.

Legend for

Jessie S. (Hospital No. 8944)

Age: 5 years.
Diagnosis: Acute nephritis.

Family history was negative. Jessie had been a fairly well child except for having had measles, chicken pox and whooping cough, from all of which she had recovered apparently without any sequielle. Her present illness began three weeks before entering the hospital with a sudden onset of an acute sore throat. Two days after the sore throat started she began passing very little urine, only as much as four ounces the day before admission. First, her face became swollen and then her extremities. On admission she showed marked general edema, especially of the eyelids and there was marked pitting of the extremities. She was very pale, otherwise

Form 140—25m-9,'20

UNIVERSITY OF CALIFORNIA

UNIVERSITY HOSPITAL HAHNEMANN HOSPITAL

NURSE'S RECORD

Name: Jessie S. Location H. Ward

Hours	Temp.	Pulse	Res'n	Urine	Stool	Medicine	Nourishment	Remarks
P.M.	— R	September 8, 1920					— Wednesday	
8 35	39^{4}	126	22				H_2O 30	Pt. put in hot moist pack.
8:45							H_2O 30	Perspiring freely. Sighing frequently.
							Chipped Ice	
9:50							H_2O 60	Perspiring
10:00							H_2O 30	" " "
10:15							H_2O 30	" " "
10:30							H_2O 30	" " "
10:45		126						Pack removed
								Alcohol rub
				✓	I			Involuntary def.
11:00						℞ Pulv.	H_2O 60	Pt. very talkative
11:30								Sleeping.
A.M.	— R	September 9, 1922					— Thursday	
12:00	39^{4}	140	24					Sleeping.
1:00							H_2O 30	Awake
1:35							H_2O 60	" " "
2:00								" " "
2:15								Sleeping—restless.
3:00							H_2O 60	
4:00	38^{6}	126	24					Sleeping
					I			Involuntary soft brown def.
4:45								Sleeping
5:30							H_2O 60	Hot moist pack
6:00							H_2O 30	Perspiring
6:10							H_2O 4	" " "
6:15							H_2O 8	" " "
6:25							H_2O 15	" " "
6:30				✓			H_2O 30	" " "
6:45							H_2O 60	" " "
7:00							H_2O 60	Pack removed
						M. Magnesia XV cc.		Alcohol rub.
							H_2O 30	
7:30							Protein-free diet	Refused portion sent to Diet Kitchen
							H_2O 30.	
8:00	37^{8}	160	24					Sponge bath.

NURSE MUST SIGN NAME TO EACH RECORD MADE.

her physical examination was negative. The urine showed large amounts of albumin and numerous red cells and granular casts. She had a hemoglobin of 65% and a white count of 8,000. Her urine culture showed streptococcus viridens. Her temperature, pulse and respiration charts shows the fluctuation of her temperature during a part of her stay in the hospital and the two days nurse's notes appended show the type of treatment which she had during the period when she was receiving the hot

Form 140—35m-9,'20

UNIVERSITY OF CALIFORNIA

UNIVERSITY HOSPITAL HAHNEMANN HOSPITAL

NURSE'S RECORD

Name Jessie S. Location H. Ward.

Hours	Temp.	Pulse	Res'n	Urine	Stool	Medicine	Nourishment	Remarks
A.M.			Sept. 9, 1922				Thursday	
8.00	38^5	110	24					Sponge bath
								Pt. put into hot dry blankets
								Hot bags to feet.
								Very talkative.
10:00								Sleeping
11^{30}						Milk of Magnesia 15/	H_2O 30|	Awake
							Protein-free diet	
								Pt. complains of burning in throat.
11:25		114						Hot moist pack.
12:00	39	120	28				H_2O 30|	
P.M.								Cold pack to head.
1:10							Cracked Ice	Ice cap to head.
							H_2O 15|	Skin moist.
2:00							H_2O 4|	Perspiring freely.
				✓			H_2O 30|	
2:30		130						Pt. very restless
3:00								Perspiring freely.
								Removed from pack
								Alcohol rub.
3:20						Milk of Magnesia 15/	H_2O 30|	
							Orange Juice 30|	
4:00	39^6	122	28					
4:30					I			Liq. brown def.
								Pt. very restless.
							Protein-free diet	Refused.
5:00								Sponge bath
								Hot dry pack.
6:00					I			Large liq. brown def.
6:30							H_2O 30|	
7:45							H_2O 60|	Hot moist pack.
8:00								Perspiring freely
							H_2O 4|	
8:15							H_2O 30|	

NURSE MUST SIGN NAME TO EACH RECORD MADE.

packs. Her temperature gradually went down though her edema persisted for several weeks. She was in the hospital for three months, and when discharged she still had a slight amount of edema and quite a marked trace of albumin in her urine.

In such cases of acute nephritis, which go on to the form of sub-acute nephritis, the outlook for complete recovery is not very good.

FIG. 114.—Hot pack showing layers with rubber sheet between.

FIG. 115.—Hot pack with ice bag at head.

butyric acid. This body is formed by the disintegration of fat and protein molecules under unfavorable conditions of oxidations. Oxidizing processes take place so rapidly that acetone is the first of these bodies to appear in the urine, and as the oxidizing powers fail, diacetic acid and later oxybutyric acid appears. This acid intoxication has very bad results. The direct toxic action of these acids removes the alkaline bases such as calcium, potassium, sodium and magnesium, all of which are necessary for normal metabolism. Poisonous alkaline bases such as ammonium are brought in large quantities into the blood by the toxic acid action. Finally, the separation of CO_2 from its bases produces a carbonic acid poisoning.

Many interesting studies have been made of the influence of food upon these acid conditions. Foods with a predominance of acid-forming elements do increase the urinary acidity. Rice and whole wheat bread have been found to do this, also plums, prunes and cranberries owing to their benzoic acid content. Foods which have a preponderance of basic elements like potatoes, oranges, raisins, apples, bananas and cantaloupes are very efficient in reducing the acid output.

6. **Pyelitis** is a frequent condition among children and is characterized usually by pus in the urine or large quantities of bacteria and little pus. (Chart 15.)

The symptoms of pyelitis vary. Sometimes there is nothing to call attention to the urinary tract. The child may have merely a rise in temperature accompanied by restlessness and fretfulness so severe at times as to suggest beginning meningitis, and rather an indefinite discomfort, or the child may be drowsy and quiet. Sometimes the diapers are stained. There is usually a loss of appetite (anorexia) and often there is vomiting. The gastro-intestinal symptoms come with diarrhea. Pain comes in paroxysms and is seldom referred to bladder or kidneys, though it is due to the blocking of ureters with masses of pus. This blocking may often be relieved by increasing the water intake, which will reduce the swelling and tenderness of the kidneys and allow the pus to escape. This swelling and tenderness of the kidneys is not great enough to cause any actual enlargement and the kidneys are usually not tender to palpation. Tenderness over the bladder is a more common finding. Frequent micturition (urinating) may or may not be a symptom of the condition. If urine is passed very frequently, it is usually painful. The child loses weight rapidly and becomes anemic quickly; leucocytosis is sometimes high. The diagnosis is only made from the examination of the urine.

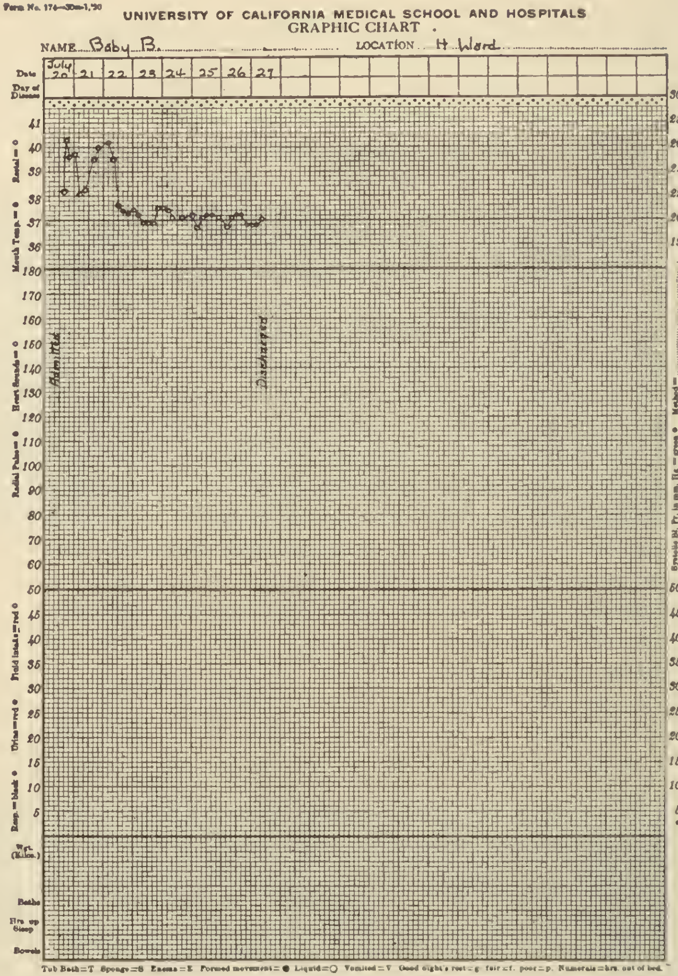


CHART 15.
Legend for
Baby B. (Hospital No. 15570)

Age: Eleven months.
Diagnosis: Pyelitis.

The child gave the following history. She had been a full-term normally delivered baby who had done very well until two days before entrance when she became very irritable and refused her food. She cried continuously. Her physical examination was negative throughout and only on examination of the urine was the cause of her trouble found. The urine was found to contain many pus cells, no red blood cells and many motile bacilli. The culture of her urine showed colon bacilli. She was put on forced liquids and alkaline treatment and her temperature chart shows that on the third day after admission her temperature fell and remained normal. When the temperature became normal the urine cleared up and within four days after admission her urine was almost clear and remained so until discharge.

Mode of Infection in Pyelitis. There are three theories given as to the cause of pyelitis. First, the hematogenous or descending theory, which makes the blood the source of the infection. Certain very strong facts give supportive evidence for this theory. Pathological lesions of the pelvis of the kidney have been found at autopsy without any lesions of the ureters or bladder. The reddened urethral orifices discharging pus into the normal bladder points to the blood as the source of infection. Also bacterial infection occurs in many diseases. On the other hand at least 60 per cent of the cases found in girls point to other methods of infection, although the fact that boys are infected and in them the second theory of ascending infection is very improbable.

The ascending theory is based on the fact that the wide urethra leading from the bladder makes infection easy. However, infection of the bladder is seldom found in the condition of vulvo-vaginitis which would seem to refute the ascending theory. At the same time the urine in pyelitis is often characteristic of the acute bladder condition of cystitis, and the mucous membrane of the bladder is often involved while the ureters and pelvis of the kidney are found free from pus or bacteria. This bladder involvement, however, might be due to stasis (retaining of the urine in the bladder). The fact that pyelitis often follows an intestinal disturbance has a significance which gives rise to a third theory as to the method of infection. In intestinal disturbances diarrhea diminishes the quantity of urine passed, and the intestinal infection increases the virulency of the colon bacillus. Opposed to this is the diminishing resistance not only of the child but of the bladder due to the general toxemia.

The transparietal theory is based upon these conditions. Some lesion in the intestinal mucous membrance easily accomplished in intestinal disturbances allows the passage of the colon bacillus directly from the intestines into the bladder. This has been shown to take place when the mucous membranes are inflamed. In boys, the infection is more often transparietal. In girls one might say the infection is usually by way of the urethra, while cases in both boys and girls are found that are hematogenous in origin.

The pathologic changes in pyelitis are often very slight, some cases retaining a swelling of the mucous membrane of the whole of the urinary tract, some cases showing desquamation of the epithelium and sometimes evidence of the degeneration of the lower tubules of the kidney is present. Study of many cases

of pyelitis show that the bladder alone may be involved, or the pelvis of the kidney alone may be involved, or both the bladder and the pelvis of the kidney may be involved. The part that is first affected or remains the one most largely affected, depends upon the method of infection, hematogenous, ascending or transparietal. Sometimes it is possible to tell from the condition of the urine and from symptomtology where the chief focus of infection lies.

Tenderness over the kidneys in the lumbar region point to kidney involvement. Tenderness above the bladder in the hypogastrium point to bladder involvement as well as frequent and painful micturition. But in many cases neither urine findings or symptoms aid in localizing the focus of infection. The disease is apparently primary in two-thirds of the cases, though when tonsillitis is present it is difficult to tell.

In others it is secondary to a disturbance of the intestinal tract, or to either constipation or diarrhea.

In many cases, pyelitis is characterized by the presence of an exceedingly large number of bacteria in the freshly passed urine. If so, there are usually no marked symptoms of inflammation in the urinary tract. This type of pyelitis is very common in infancy and is almost always due to B. coli. As a rule there are no severe symptoms, malaise and slight temperature being the usual signs. Sometimes there is frequent and painful micturition while older children may have incontinence and the urine passed is cloudy like a boullion culture of bacteria. The reaction is acid, due to B. coli, as B. coli often is found in pure culture. There is usually less than one-tenth per cent albumin.

The urine in pyelitis in general is usually highly colored, turbid and cloudy, due to pus cells and in part to bacteria. In some rare cases the urine may be gelatinous. In any case the odor of the urine varies from stale to very foul. When pus predominates, the pus cells form into clumps in sediment. Caudate, small, round and squamous cells are found and hyaline and fine granular casts are often seen, but blood or blood elements are rare. The amount of urine depends on the liquid intake.

Prognosis is good, fully 90 per cent recover, but the duration of the condition, especially of the bacterial type, is often long, sometimes several months or years. This long condition often leads to the contracted kidney or to a nephrosis. Relapses are common and sudden flaring out of acute symptoms mark the course of the disease. Complications are unusual.

Treatment of Pyelitis. Local irrigation of the bladder is of little value. Hexamethylenamine (urotropin) sodium benzoate,

or mono-sodium phosphate, are the medicines used. Giving mono-sodium phosphate will increase the true acidity of urine so that when urotropin is given the concentration of formaldehyde in such urine is markedly increased.

When giving urotropin, alkalies are contraindicated, as an alkaline urine prevents the liberation of formaldehyde. Alkaline treatment consists in giving soda bicarbonate or potassium citrate or both, in doses of from 5 to 20 grains each, from three to five times a day. At times, it is difficult to get the urine alkaline. In such cases the alkalis may have to be given in much larger doses and more frequently. In most cases the urine can be made alkaline in from one to three days. Sometimes the alkalis cause vomiting. In such cases large quantities of plain water will dilute the acidity of the urine and produce very favorable symptomatic results, i.e., lessening of pain and temperature. The theory underlying both the acid and the alkali treatment is to kill off as rapidly as possible the infecting organism. The reaction of the urine can be followed easily by testing with litmus paper.

Vaccine treatment has been given with good results in many cases. An autogenous vaccine from 10,000,000 to 100,000,000, depending on the child's reactions every second or third day, is used. In persistent cases direct lavage of the pelvis of the kidney must be used. Before a case can be considered cured, the urine should show no organisms and no pus cells and should be culturally free. In chronic cases the urine never becomes entirely free from pus cells and organisms.

7. **Vulvovaginitis** is characterized by a purulent urethral or vaginal discharge. The vast majority of cases are found in girls and are of gonorrheal origin. Vulvovaginitis is a highly contagious disease and gives great trouble in hospitals and institutions. When the infection is acute there is marked local inflammation, redness, swelling and profuse vaginal discharge filled with pus cells, containing the gonococci. At first the micturition is frequent and painful and there may be even general constitutional symptoms with fever. After the acute stage has passed, the presence of the discharge may be the only symptom with the exception of the reddened surrounding parts. Gonorrheal infections tend to be most chronic. There will be periods in which there is a profuse discharge, followed by periods in which there is no visible discharge, but careful examination in taking smears of the vaginal secretions will still show the presence of the gonococci. Even during this latent period, the child is a source of contagion.

The symptoms in boys are about the same, profuse discharge,

painful micturition, and occasionally generalized symptoms. The major number of infections among boys are found in institutions and among juvenile court cases it is sometimes found in very young boys.

Fortunately, the signs and symptoms in girls remain local and there is little or no tendency toward secondary pelvic inflammation. Rarely do the tubes become infected as is so common in gonorrheal infections in women.

Prognosis. After the acute symptoms subside there are apparently no ill effects in the health of the girls. There is no available information I know of which shows that these mild cases of childhood persist in adult life causing more serious trouble. My own experience would indicate that such is not the case. Curiously enough, I have found the number of cases of this disease on the Pacific Coast very markedly less than the number of cases constantly met in my Eastern Coast work. Eastern hospitals require vaginal smears of every girl entering the wards, while here on the Pacific Coast, many hospitals do not require this precaution, the condition being rarely found in outpatient and hospital work.

The treatment consists first in keeping the parts clean and dry. A very good routine is to douche four times daily, using 1 to 2 quarts of warm water to which soda bicarbonate or boracic acid powder has been added to saturation. Once daily the douche is followed by the instillation of a 2 per cent solution of silver nitrate, or a 10 per cent solution of argyrol or protargol. Douches of potassium permanganate are sometimes used. After the instillation the child should lie on her back for fifteen minutes with hips elevated and thighs pressed together. In some cases, even stronger solutions must be used and in such cases it is usual to make a direct application through an endoscope with an applicator to the mucous membranes and cervix. Argyrol up to 25 per cent and silver nitrate to 4 per cent, or tincture of iodine are used for this direct application. During this direct treatment the patient should be kept in bed for several days. These direct applications have an advantage over the instillation treatment in that one can be more certain that all the surfaces are treated. After the douching the parts are to be dried. A satisfactory dusting powder is made of equal parts of zinc oxide and starch.

8. **Diabetes** is a rare condition in infancy and childhood. Only 2 or 3 per cent of diabetics are under ten years of age and as only 15 per cent occur before the thirtieth year, it cannot be a common disease of childhood. There have been probably less than 100 cases reported under one year of age.

Etiology of diabetes in children is the same as in adults. A possible explanation of the fact that it occurs less often in childhood than in adults is that the sugar capacity of children is greater. There is a definite hereditary factor and girls are

FIG. 116.—Enlarged abdomen with ascites due to hydronephroma.

more often affected than boys, though Knox's series gave more cases of boys under one year.

The symptoms are shown by a marked increase in the amount of urine and a marked emaciation. At times there are external irritations of the genitals and constipation is more often present

than diarrhea. The onset is usually sudden. The first symptom noted may be frequency of urination and enuresis, accompanied by marked thirst. The course of the disease is usually rapid, from six weeks in the most acute, to two to three years; these long cases are unusual. It is doubtful whether any cases have ever been cured when the condition began before the seventh year. It is still doubtful after the seventh year. A positive diagnosis of diabetes should not be made from a single examination of the urine in the absence of other symptoms, as temporary finding of sugar in the urine (glycosuria) is not uncommon during acute digestive disturbance which lowers the tolerance for sugar (see Harmer, p. 460).

The treatment of diabetes is the same as in later life, depending upon the principle of cutting down the carbohydrates as low as possible without bringing on an acute intoxication and keeping up the caloric content by adding fats and a limited amount of proteins. Something may be accomplished in the future for diabetes in childhood by the use of the new drug insulin which is an extract of pancreatic enzymes. In acute cases, insulin has proved of great value and though it does not cure, its constant use prolongs life in a fairly normal fashion.

9. **Malignant new growths** of the kidney and genito-urinary system are not common though several may be seen in a year in any children's hospital with a good surgical service. Sarcomas, carcinomas and other types of malignancies of this system are all met. The most common non-malignant tumor of the kidney is a hydronephroma (Fig. 116). This is usually caused by chronic obstruction to the flow of the urine through the ureters causing the urine to back up, resulting in a slow breaking down of the kidney tissue itself.

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CHAPTER VIII

INFECTIOUS DISEASES

Infectious diseases are always of keen interest to the student nurse. The care of these diseases has marked one of the great contributions of nursing education. The high mortality from these diseases has been cut down a great deal by the increasing understanding and intelligence of the nursing care. The infectious diseases, especially those that are infectious by contact, present a splendid challenge to the education of the nurse. Her fight is not only to save the case but to prevent the spread of the disease to others, and it becomes a struggle in which the smallest detail may, at any moment, become a vital factor in the situation. Care of herself in every way aseptic and care of the child in the same manner are parts of the procedure of equal importance in the nurse's fight and the aspect of the whole matter that keeps these many details from being a nuisance and a bore is that they are based upon absolute scientific knowledge of the diseases and not upon the personal whims of any physician or any professor of nursing education. Experience has proved conclusively the value of translating the scientific findings of these diseases into the practical nursing care of these diseases, and the nurse may have the satisfaction of knowing very definitely what the results of her care of a particular case may be in relation to many other lives.

We may define infectious diseases as those communicable diseases caused by microorganisms, bacteria or protozoa or minute living forms still unknown, which produce in the infected person reactions of more or less uniform type for each specific organism. All these infectious diseases may be transmitted in different ways from one person to another and the ways of transmission are the fundamental considerations in the nursing care. Transmission is by contact, by food, by drink, by insect carriers.

Such infectious diseases as Malaria, Yellow Fever, Typhus Fever, Bubonic Plague, Dengue Fever, are not transmitted by contact but by other infective agents such as insects or animals (vectors). In such diseases the specific virus is not on the surface of the body but must be carried by the bite of some insect

or vector. The mosquito of different kinds carries malaria and yellow fever. The louse carries typhus, rats carry bubonic plague, and the fight to check the spread of these diseases must lie along the lines of protection for patients from these biting insects, and the extermination of these carriers.

Measles, diphtheria, scarlet fever, smallpox, are all highly infectious diseases and are often produced by contact with the secretions of mouth, nose or throat of the sick person before any definite symptoms have appeared. The virus of these diseases passes *from* the respiratory tract of the sick person as easily as it passes *into* the respiratory tract and the nurse or any other person near the patient must be protected from the inhalations of droplets sneezed, couged, laughed or talked from the respiratory tract of the infected person.

Isolation. The highly infectious diseases which are spread easily by direct or indirect contact are the groups commonly called *contagious* diseases and this is our biggest group, being often estimated as high as 90 per cent of all communicable diseases in countries where insect or vector-borne diseases are not found. Diphtheria, scarlet fever, measles, whooping cough, chicken pox, mumps, rubella (German measles) are always handled by complete isolation of the patient. Hospitals devote either separate buildings or wards to the nursing care of these cases and many times poliomyelitis, epidemic meningitis, influenza are treated in the same way because of the uncertainty as to the infectious power of these diseases by direct or indirect contact.

Typhoid fever, active respiratory infections and tuberculosis and syphilis with open lesions are usually individually isolated on the general wards. The highly contagious skin infections like impetigo, scabies, furunculosis, ring worm and pediculosis may all be successfully handled in the same way. The confining of these infections to the initial case is dependent upon the eternal vigilance of the nurse, in carrying out the proper isolation technique and allowing no detail of the care to escape the most rigid aseptic standards. Adequate protection of herself is essential to adequate protection for other patients.

Every institution for children, particularly every hospital receiving sick children, should be provided with facilities by which every newly admitted child may be separately isolated for a period long enough to determine whether a contagious disease is present. Diagnosis of many of these conditions cannot be made instantly. The early stages of measles and whooping cough often resemble very closely a common cold or an acute bronchitis. The early stages of diphtheria or scarlet fever often resemble

closely a severe tonsillitis. Typhoid fever cannot be diagnosed in a day. Precaution is the better part of wisdom in handling the newly admitted child and the modern admitting ward built on the cubicle system with each cubicle provided with isolation conveniences has proved its economy in both money and lives. Such a ward is conducted very much as the contagious ward is operated.

Transmission of Infection. The cardinal principle to remember here is that you are handling active living agents as well as your patient and the transmission of any infectious disease from the sick to the well case will rest upon the ways and means by which those living agents or viruses may enter the body of the well person and what protective immunity the well person may possess with which to meet the invasion. A susceptible person meeting by direct contact a communicable disease of high infectivity succumbs to the infection. Therefore quarantine and isolation are necessary. This contact mode of transmission is comparatively simple to combat but the infection from the unknown or unrecognized source presents great difficulties. The human carrier of typhoid or diphtheria, poliomyelitis, or epidemic meningitis may go undetected and spread these diseases broadcast because a human carrier is not alone confined to the possible convalescent from any of these diseases but may be an individual who never has and never does show any clinical evidences of disease and yet carries the virus in the upper respiratory tract, in the intestinal tract. In other cases, the clinical evidences of the disease may be so slight that only laboratory evidence would be convincing. Again a human carrier may harbor a virus that is not virulent, i.e., capable of producing active toxin, and this must be determined by laboratory tests.

Infection by droplets of secretion from coughing and sneezing is naturally a limited mode of transmission if any ordinary isolation is maintained. Of course, a patient coughing and sneezing in a room with an electric fan running might spread the infection further by air currents or the vigorous use of a broom or mop close to the patient's bed might spread the virus of long-lived types some distance in either home or hospital, but fortunately the virus of many diseases of high infectivity like measles lives but a short time after exposure to light and air. The virus of scarlet fever, diphtheria, tuberculosis is long lived and old, improperly built hospitals or crowded dark blocks of tenements can habor these viruses and produce these diseases by this indirect method of contact a long time. Contaminated

dishes, toys, clothing, books, can transmit these contact diseases not only directly but by way of a third person.

Proper precautions for care of contagious patients. Such care is dependent upon accurate knowledge of the conditions and common sense in the technique of the nursing care. Imaginary fears have no place here but honest respect for the scientific facts and scrupulous care of the details of nursing procedure are essential. The emphasis here includes both nurse and patient.

A nurse may care for different contagious diseases in neighboring rooms without cross infection if in each case she is "clean" when she leaves the room. Keeping herself "clean" is dependent upon the way she handles her patient. A nurse may leave the room "clean" if she has not touched with her gown or her hands anything in the room the patient has touched or the patient himself, since changing her gown and thoroughly scrubbing her hands with soap and water.

The use of the gown to protect the clothing of nurse, doctor or any one coming into contact with the patient is a very definite protection to patients and persons outside of the sick room. It is far better for the nurse to have an entire change of clothing for use in the contagious ward or sick room rather than merely covering her street clothes or ordinary uniform. If just a "gown" protection is used, it may be folded and hung so as to keep the inside, which touches the undergarments, "clean."

The hospital, especially one equipped to care for contagious diseases, usually offers every facility for enforcing the necessary "cleanliness" and isolation. When the contagious case must be cared for at home there are often many difficulties, but "where there is a will there is a way" and many cases have been successfully handled and successfully limited to the initial infection in quarters not at all ideal for the purpose. The nurse should endeavor to get for her patient the room farthest removed from the family life and if possible an adjoining room for herself to be used for her meals, for the exchange of her clothing, for any boiling or soaking of utensils or linen used in the sick room. Many adaptations of the nurse's education in these matters may have to be made to meet the problems of the family life and the nurse with keen intelligence and real social vision can make such adjustments without jeopardizing the care of her patient. The strict isolation of the patient is often the hardest measure to enforce aseptically without increasing the family fears and anxiety for the patient. Often the family is densely ignorant of the dangers of contagion in neglect of small things, while having a most exaggerated idea of contagion from some more obvious

angle. Some mothers bank firmly on the slogan "don't kiss the child" and think boiling the dishes the child uses "mere fussiness." Most families retire meekly before the old carbolic sheet in the doorway but when it becomes necessary for one of them to enter the sick room, the nurse must insist upon the same rigid rules of quarantine which she enforces for herself. Unfortunately the care of the sick child must always be complicated in the family life by the quarantine at home of the other children who are well and active and always rebellious at being kept away from other well playmates. Bedlam at home is usually the result and the morale of the best regulated home is often seriously out of joint. This is one reason why the sick child usually does better in a hospital away from the noise of the well children and the unexposed well children can then continue at school after the usual period of quarantine is over, i.e., the time of incubation period of the disease.

In home care of contagious disease, it is always best for the nurse to take entire charge of the care of the rooms occupied by herself and patient. This type of care can be reduced to the minimum by the elimination of every unnecessary article in the room. If this is done, the nurse's housework will be limited to the daily wiping of floor and furniture with a damp cloth, as everything else in the rooms will be the usual articles needed by her.

Sterilization of Contaminated Articles. All articles used by and for the patient should be destroyed unless they can be successfully rendered sterile. In hospital care this sterilization by steaming or boiling is the basis of the control of the infection. At home where the nurse must attend to dishes, bed linen and clothing, it is not of course possible to do all of this in her room but she must be responsible for the supervision of the handling of any linen that leaves the sick room contaminated. It should be wrapped in a "clean" covering and boiled or steamed in the home laundry or a special boiler reserved for this purpose in a part of the room separated from other uses.

Disinfection. When the patient is well and ready to come out of quarantine, the cleaning up process is simple, reasonable, but rigid. All articles possible to sterilize by steaming or boiling should be so treated. Such articles as mattresses, shoes, furs, outer garments, can be thoroughly fumigated by days of exposure to air and sunlight. Mattresses and clothing may be autoclaved if desired. The old-fashioned method of attempting to seal up a contaminated room and fumigate by the use of concentrated formaldehyde gas has been abandoned by most modernly

trained physicians because of the impossibility of sealing rooms absolutely and thus maintaining an effectual concentration of the gas for a long enough period. Sunlight, fresh air, steam and boiling water applied to the various articles that have been used are more effective although the smell of formaldehyde is often more reassuring to nervous parents. In cleaning up the room, the advantages of the room free from curtains, rugs, carpets, upholstered furniture, bric-a-brac, et cetera, is easily seen and it is the argument that will help the nurse eliminate many things in the beginning, i.e. that it may be damaged by the necessary fumigation later!

Discharge of a Contagious Patient. When a patient has had a cleansing bath which includes the hair, and cleaning of nails, and then is dressed in a clean room in clean clothes, he is ready to be discharged from the hospital or at least allowed in the other parts of his house. Again it is not necessary to send the patient out reeking with antiseptic solutions in order to prove him clean and healthy.

Definitions. As we approach the discussion of the particular infectious diseases in which a generally accepted terminology will be used, it might be well to define certain phrases. The "incubation period" is the time which intervenes between the entrance of a living agent into the body and the first manifestation of symptoms caused by that particular virus, in other words the gap between exposure and disease. The disease manifestations will not develop unless the exposed person is susceptible to that particular virus. If the person is susceptible at the end of the incubation period, certain symptoms will appear and these are known as "the initial symptoms" and the period in which these initial symptoms appear is spoken of as the onset of disease or the "period of invasion." These initial symptoms often do not suggest the particular disease but are vague premonitions of trouble known as "prodromal symptoms." When the disease reaches its highest point spoken of as fastigium it is sometimes spoken of as the "florescent stage," the time the disease is in full bloom; in measles or scarlet fever it is when the rash appears, known as the "eruptive stage." The high point in whooping cough is called the "paroxysmal stage." When the drop from the high point is rapid we speak of "by crisis," when the disease subsides slowly, "by lysis." The period of slow improvement is known as the "stage of decline." In diseases with eruptions it is called the stage of desquamation.

1. **Measles** is the most contagious disease next to small pox which the nurse meets in her hospital, institution or private work.

Practically no child between the ages of 6 months and 10 years exposed to measles escapes an attack. Passive immunity is transferred from mother to infant which lasts about six months but of course if the mother is not immune the infant will not have protection for even this period. Many adults, however, escape childhood infection as the army camp epidemics showed when thousands developed measles. In civil life measles among adults is uncommon and likewise second attacks are seldom seen, even rarer is the repetition of the attack before convalescence is over. The writer has seen but a few such cases.

The cause of measles is a filterable virus which occurs in the early secretions of eyes and throat, and in the blood before the eruptions have occurred on the mucous membranes or skin. The infectivity of measles is also early, the most contagious period being when the child begins to cough or sneeze. Unfortunately this coryza differs little from an ordinary head cold and hence the importance of isolating the cases of head colds brought home from school. The younger children in the family almost invariably trace their infection to this source. After symptoms develop in the older children, isolation of the young children is still important but prevention cannot be expected. The incubation period is between 10 and 14 days, practically never shorter than 7 days or longer than 18. Therefore most quarantine periods begin one week after exposure and last for two weeks for susceptible children, that is, most children under 10 who have no definite history of measles.

From 4 to 6 days after the first sign of coryza—sometimes earlier, rarely longer—the initial symptoms appear first as fine blue white pin point areas on the mucous membranes of the mouth, especially along the gum line or teeth area, on the palate they appear red. They last from 24 to 36 hours. All the symptoms now develop fairly rapidly, the coryza increases until there is a beginning conjunctivitis and pharyngitis, the temperature rises in the first 24 hours to 99° or 101° F., falls slightly on the second and then with the appareance of the rash on the face, the temperature usually reaches its height by the fourth day and then drops by lysis.

The typical eruption is easily distinguished, starting like small flea-bite areas along the hair line and forehead. It quickly spreads to neck, chest, axilla, arms, abdomen, groins and extremities. This usually takes from 2 to 3 days, by the time the eruption is fully developed on the lower extremities, it is fading on the face and chest. The small areas tend to coalesce forming the typical macular papular blotchy eruption.

In the same way the other symptoms develop rapidly, the conjunctivitis increases and photophobia appears, the pharyngitis, laryngitis and bronchitis all appear in sequence with pain in throat, slightly cervical adenitis, cough. Headaches, drowsiness or restlessness and irritability from the high temperature are all common symptoms.

Most symptoms in the typical case reach their height by the fourth day. But typical cases are not the only kind seen, in fact it takes a good many variations to make an average. In measles the symptoms may develop like a thunder storm and disappear as rapidly or they may be so slight that without the sharpest scrutiny they may be missed. Again, the eruptions may be scanty but the temperature high and symptoms very marked, or the eruption may be hemorrhagic—the dreaded "black measles" when the eruption appears normally and then disappears in part or whole and symptoms of cardiac failure are present which explains the "lay" dread of the "measles going in," serious for just these reasons given.

The two symptoms which the child most often complains of are the *itching* and the irritating brassy cough which disturb his rest. The itching can often be helped by sponging with cool or slightly warm soda bicarbonate water or with bran water or witch hazel and applying cocoa butter; sometimes a carbolated wash as vaseline or cold cream mixture may be prescribed that will give great relief. At any rate scratching should be prevented as far as possible and the room and child kept comfortably cool and fresh. The respiratory symptoms may be helped by the measures already described for such conditions, the appearance of such symptoms during measles in no way changes the treatment—a moist atmosphere, steam inhalations and if persistent so that sleep is disturbed a sedative such as codein will usually give relief.

In the nursing care of measles no simple detail is of more importance than the attention given the mouth and upper respiratory tract as it is through these that the infection is spread and where the most serious complications arise. The most common complications are otitis media, cervical adenitis and bronchopneumonia, all infections that enter through the nose and mouth and their prevention is much easier than their cure.

There is always a catarrhal stomatitis in measles and not only is the child's comfort increased by a clean mouth but such care will prevent the appearance of the ulcerative stomatitis (noma). This is often a fatal complication for malnourished infants and children and in institutions may often become epidemic. Cleans-

ing the mouth with boracic acid solution (2 to 4 per cent) or a weak Dobell's solution, keeping the gums and teeth clean, cleansing the tongue off with hydrogen peroxide, ginger ale or alboline with a few drops of lemon juice will make the dry mouth clean and fresh and should prevent the development of any severe stomatitis.

The prevention of bronchopneumonia is to be most ardently desired as this complication causes the immediate high mortality from measles over 80 per cent of children who "die from measles" really die as a result of bronchopneumonia. Therefore every precaution should be taken, especially during the period when there is a bronchitis. Strict adherence to the rules of isolation, the use of marks, gowns, separate room or cubicle, et cetera, are all important. The younger the child the higher is the mortality rate in measles, 50 per cent of deaths in first two years of life, 80 per cent before the 5th year and practically 90 per cent before the 10th year. The danger of the streptococcus carrier in doctor, nurse, or family, the contagiousness of pneumonia when it does develop, emphasize the necessity for isolation procedure. The time will come—has come in many institutions—when these precautions will be strictly followed. Where it is done, cross infections do not occur, pneumonia does not become epidemic and the result is a low mortality. From the point of view of secondary infections it is really safer to nurse a child at home than in a hospital, other things being equal.

For the comfort of the patient and to prevent any complication the eyes should be protected from direct and glaring lights by the use of screens and for older children by the wearing of dark glasses, rather than darkening the entire room. The eyes should be irrigated with boracic acid or Ringer's Solution and if any discharge collect argyrol 10-20 per cent is usually ordered to prevent or control infection.

Severe complications such as acute carditis, nephritis, meningeal or nervous conditions are rare. Digestive symptoms, especially in infants, may be quite acute, persistent and troublesome. During the first few years vomiting and diarrhea may mark the onset and so overshadow the infection that it is not suspected until the rash appears, indeed it is often such cases that introduce the infection into clean wards thereby emphasizing the importance of cubicle observation pavilions for admitting cases in every hospital for infants and children.

The **diet** is the usual food and fluid for the sick child, first and foremost plenty of water which will lessen the symptoms, make the child more comfortable and prevent the development of

acidosis; second, the food should be diluted to strength most easily digested, acid fruit juices with high caloric values given (every ounce of sugar adds 120 calories). When temperature and symptoms subside return the food to normal gradually.

Convalescence. After 3 to 5 days symptoms disappear, the cough, however, may linger for several weeks depending upon the irritation from the bronchial glands caused by the bronchitis.

Desquamation begins on the face, small bran-like flakes peal off, and two weeks usually finishes the process. These flakes carry no infection whatever. Only the secretions of eyes, ears, nose or mouth are truly infectious.

Sequelæ. Acute tuberculosis may develop if a child is exposed to tuberculosis or has developed a "tuberculous infection." Resistance is low and immunity to tuberculosis reduced as shown by the disappearance of the tuberculin reaction during the period of invasion and temperature and often not restored until after convalescence. Tuberculous infection may have been in the bronchial glands ready to flare out, and spread throughout the body in the form of miliary tuberculosis or tuberculous meningitis or both. Careful, watchful convalescent care therefore must not end until some time after perfectly normal weight, vigor and general health is restored.

Prophylaxis. In institutions and during epidemics passive immunity may be obtained by giving intramuscularly serum from recent convalescent patients, that is, 5 to 20 c.c. of serum from a case 10 to 40 days beyond complete recovery. Reports here and abroad are beginning to indicate the possibilities of such treatment and it should be tried for young infants.

2. Rubella (German Measles). This contagious disease of childhood is largely significant because of the possible confusion of it with scarlet fever or measles. The disease itself is of little importance but if a true case of measles or scarlet fever is allowed to develop under the diagnosis of German measles with little regard to isolation care or quarantine much damage can be done.

No specific organism of this disease has been discovered but it is believed that the virus is in the early nose and mouth secretions. The incubation period is from 10 to 21 days and the infectivity of the patient extends probably over the first 8 or 9 days after the symptoms appear.

The **symptoms** differ from measles symptoms in that the initial catarrhal symptoms are not present, Koplik's spots are not found, and the rash consists of light red macular spots very rarely running together as in measles. The rash begins on the face and

scalp and in about 24 hours spreads over the entire body. It may begin with a complete eruption. The rash disappears in 3 or 4 days. There may be pinhead red spots on the soft palate; at times a reddened throat and tonsils are present.

The disease is spread directly by contact with the patient or indirectly by articles contaminated with nose and mouth secretions. Adults as well as children may have the disease and a true attack of measles is no protection for German measles.

The **prognosis** of rubella is good and one attack usually gives immunity. Complications are few as the temperature is slight and quickly subsides. The *treatment* consists of the proper isolation procedures, with a light diet during the temperature, and the normal hygienic care. Isolation need not extend beyond the desquamation period.

3. **Whooping Cough.** (Pertussis). Whooping cough is almost as prevalent, as contagious and as dangerous as measles. It causes one of the highest infant mortalities due to contagious disease, because in whooping cough, as in measles, bronchopneumonia is the most frequent and the most fatal complication, especially when whooping cough occurs in the first two years of life. About 80 per cent of all pertussis patients are under five years of age and 50 per cent are between 2 and 5, and the greatest mortality occurs under the 5th year. Because of the involvement of the bronchial lymph nodes in bronchopneumonia as a complication, whooping cough is often followed by tuberculosis if the child has had a previous infection. More than this, recent studies of asthma and chronic bronchitis in older children show that a large percentage of cases owe their asthma to an initial attack of whooping cough. It is more prevalent during the fall and winter months when upper respiratory tract infections are most usual.

Whooping cough is caused by the Bordet-Gengou bacillus. The lesions caused by this bacillus are in the ciliated epithelium lining in the trachea and bronchi, the cilia and superficial cells being destroyed. The first symptoms are those of an upper respiratory tract infection, coryza, pharyngitis and cough. Later when the cilia have been denuded because of the inability to dislodge the mucus accumulated in the bronchi and trachea, there is a characteristic inspiratory whoop.

Symptoms. The disease may be divided into three stages, *first,* the onset period described above which lasts from 10 to 14 days during which the infectivity is highest. Second, the period of severe paroxysms of coughing that the patient cannot get his breath between them, and it ends in the characteristic whoop. A

single paroxysm may last several minutes and end, after a half dozen whoops, in vomiting and expelling a mass of sticky mucus. These attacks increase in intensity for the first two weeks varying from six to fifty in 24 hours. Third, the course of the disease halts and remains at the high point of intensity for about a week and then gradually diminishes. These symptoms clearly indicate the care and protection necessary for a patient weakened by such symptoms.

Complications. Frequent complications due to mechanical causes occur. Nose bleeds are very frequently due to the intense venous congestion. Hemorrhages into the conjunctiva and from the bronchi may occur. Intracranial hemorrhages are sometimes caused by the severe paroxysms, and spastic conditions may follow. These cerebral involvements may be ushered in suddenly with convulsions and often follow upon a series of acute paroxysms. Cerebral paralysis, hemiplegias, meningeal complications may occur. The most serious complications, however, and the most frequent are due to secondary infections of the respiratory tract. Bronchopneumonia causes the greatest mortality and renders whooping cough one of the most dreaded diseases of infancy and early childhood. Bronchopneumonia is by far the most frequent type though lobar pneumonia is met with in older children. Either form of pneumonia usually appears during the paroxysmal stage, at the height and during the decline. The whoop may disappear though the cough may become more persistent. There is always increased malaise and temperature. In debilitated children the onset of the pneumonia may be most insidious though rapid. The diagnosis of these conditions does not differ from the ordinary cases of pneumonia.

Treatment. The best treatment is preventive vaccination with the Bordet-Gengou bacillus vaccine. The initial dose for children under one year should be 250 million organisms. The dose should be repeated at 2-day intervals, increasing the dose to 500 million the second time, 1,000 million the third, 2,000 million the fourth, and 4,000 million the 5th dose. For children over one year, the initial dose should start with 500 million and increase proportionately. The vaccine treatment has worked most satisfactorily as a prophylactic. It is not of much value as a curative treatment, although, if given early, it may often diminish the number of paroxysms and shorten the course of the disease, both results well worth accomplishing. X-ray treatment has been favorably reported. General hygienic and diet care are most important as the child's progress depends upon

keeping up his resistance to complications. On account of the vomiting, the nutritional problem demands great care. The coughing is often brought on by eating, and the vomiting follows. Food must be replaced by repeating the meal after the paroxysm is over. A broad well-fitted binder will often limit the number of paroxysms and will lessen the abdominal pain which is often severe. Creosote or any coal tar oil products used in steam inhalations may give relief during the catarrhal and paroxysmal stage. In severe cases the administration of chloroform may prevent convulsions and intubation has sometimes been resorted to with benefit.

For internal use no drug has given more favorable results than antipyrin, infants can take 1 grain dose every two or three hours if necessary and children between two and four years may take double this dose. Belladonna is sometimes used for older children, sometimes atropin, antipyrin can be combined with sodium bromide or may be given with cod liver oil. The whole point of the drug treatment is to diminish the frequency and intensity of the paroxysms and it is a mistake to begin their use before that need becomes severe or to prolong their use beyond the period in which they give definite therapeutic results. Drugs are used for symptomatic rather than curative effects.

Fresh air, and plenty of it, is always a safe available treatment. Windy and dusty places should be avoided. In very delicate children during winter, it is better to give them fresh air indoors as outside exposure may quickly convert a simple bronchitis into a bronchopneumonia.

4. **Scarlet Fever** is an acute infectious disease and one attack of the disease gives immunity. Children are more susceptible to scarlet fever, although probably not more than half of the children exposed to scarlet fever contract the disease. Infants are not very susceptible but from the 1st to the 5th year, children are very susceptible.

The infection is usually by direct contact. The incubation period is from 1 to 4 days and the disease is contagious from the day of invasion. The cause of scarlet fever has not been discovered. It is, however, somewhat closely related in its development to the streptococcus. Streptococci are usually found in the tonsils and pharynx and in the discharges from the ears and when so found these discharges are very contagious. The contagion is usually carried by secretions from the nose, mucous membranes of the mouth and pharynx, and from discharges of the ear.

The eruption lasts from 4 to 6 weeks. It is seen on the

skin and mucous membrane of the mouth and throat. There is an acute hyperemia and a fine punctate rash which is seen first in the mouth and throat and on the tongue. The pharynx shows a deep erythematous blush which spreads over the tonsillar region and hard palate where a minute punctate rash may be seen. The rash on the body is first noticed on the neck and chest. The face is usually flushed and around the lips there is a pale areola, but usually the whole body is soon covered. A very fine minute punctate rash is more marked in the groin, axilla and back of the thighs. Desquamation starts in after the rash has disappeared. Convulsions may occur in severe cases in young children. In mild cases the rash may be faint or entirely absent. The symptoms are those connected with high fever, and toxicity, often delirium and marked prostration are present and the heart action may be rapid, weak and irregular. Hemorrhages from the nose and throat are not uncommon and at times ulcerations may appear in the pharynx, tonsils and uvula.

Complications. The most frequent complication is otitis media and the younger the child the more frequent is the occurrence of otitis which accounts for more cases of permanent deafness and deafmutism than any other contagious disease.

The second most frequent complication is nephritis. It may occur either in the early stages of the disease or during convalescence and is probably due to the secondary invasion of the streptococcus rather than to whatever organism or virus causes the scarlet fever. The nephritis is of the destructive degenerative type, being a diffuse glomerular type with edema and urine loaded with albumin, blood, casts and pus cells. The recovery from this type of nephritis is usually long and often develops into chronic nephritis. Endocarditis and pericarditis are complications most often seen in septic cases and are again due to the secondary invasion of the streptococcus.

Prognosis in scarlet fever is difficult and it is always doubtful. The younger the child the more serious it is. Some severe cases succumb in the first three or four days but few patients die from the severity of the disease itself. Streptococcus infections following the course of scarlet fever cause the high mortality. The general mortality after 5 years is not nearly as high as before 5 years, varying from 10 to 14 per cent.

Treatment. There is as yet no specific method of combating scarlet fever. Vaccines and serum have been unsuccessfully tried. The blood of recently recovered patients is not readily obtained in large enough amounts to make general such a mode of treat-

ment and the trials have been limited to only the very severe cases. The nursing care consists very largely in, first, carrying out the proper quarantine and the adequate disinfection rigidly; second, the general hygienic care of the patient, and the diet must be carefully regulated as the best aids to recovery, and third, watching for complications in order to avoid unexpected disasters. During the height of the eruption, the itching discomfort of the skin may be helped by sponging with a bicarbonate of soda solution or by constant use of rice or talcum powder. After the rash and fever have disappeared daily warm baths may be used and vaseline rubbed gently over the entire surface of the body to aid desquamation. The daily examination of urine during the first week or two of the disease is absolutely necessary and the nurse should be prepared to measure and record accurately the urine of 24-hour periods throughout the entire attack. During convalescence the urine should still be frequently examined. Weak, rapid or irregular hearts at any stage of the disease must be stimulated and digitalis is the drug most often used.

5. **Diphtheria** is an infectious disease due to the invasion of the Klebs-Loeffler bacillus. Since the discovery of diphtheria antitoxin in 1895, the disease has become a controllable one. If the antitoxin is injected in the first hours of the disease, the percentage of recoveries is 100. The disease affects the mucous membrane of the pharynx, tonsils and throat and frequently the larynx. Locally the effect is a necrosis. In general the effect is a toxic degeneration of the cardiac muscle causing a fatty degeneration of the muscle. Lymph nodes are usually slightly enlarged. The incubation period is from 24 hours to 3 days and direct infections cause most of the cases. The bacilli are found in the saliva and mucus of the mouth and nose and are spread by coughing, sneezing and even talking.

Symptoms. In infants and young children there is usually little or no local pain or soreness of throat so that unless careful examination is made the true condition may be easily overlooked. There are few or no prodomal symptoms, the infant or child at first seeming just listless and apathetic without enough temperature to account for it, which is rarely over 100° F. at this time. This fact itself is suspicious. The temperature from an acute follicular tonsillitis, and otitis media or pyelitis is usually high and the symptoms much more alarming. The diphtheria toxin works insidiously, rapidly and with few outward manifestations until the toxic effect on the heart or cardiac or respiratory centers begin to show and then the damage is done for diphtheria toxin

that has once combined with the tissue cells cannot be affected by even large doses of antitoxin—antitoxins neutralize the free toxin but not the combined.

The first lesions are small greyish white membranes that spread rapidly. They appear first in most instances on the tonsils, coalesce and gradually cover the entire throat. The membrane is composed of fibrin and cells and is always tenacious, leaving a bleeding surface when removed. A very similar membrane is at times produced by other organisms, especially streptococci, so that the only way of making a positive diagnosis of diphtheria is by a study of the organisms after they have been incubated and grown from 8 to 18 hours on a special blood serum medium (Loeffler's). All throat conditions in children should be cultured, for even catarrhal discharges from the nose, particularly if bloody and excoriating, may turn out to be diphtheritic.

As the membrane spreads, the local edema increases and the cervical glands are enlarged and tender, prostration becomes more marked and signs of cardiac difficulty develop. At this time a diagnosis is not difficult to make but it is often too late. Delay in treatment with antitoxin increases the mortality in an almost geometrical ratio, if treated on the first day of the infection the mortality is less than 1 per cent, on the second day 4 to 5 per cent, on the third day 10 to 15 per cent, on the fourth day 15 to 25 per cent. To be sure a certain number of individuals will recover without antitoxin treatment, before the use of antitoxin the mortality in different epidemics varied from 40 to 80 per cent.

Diphtheria is still always a condition to be found in large centers of population and almost every year epidemics of it break out in different communities—this in spite of the fact that we know what causes it, we know what spreads it, we know how to stop it, we know how to find out whether an individual is immune or susceptible, we know how to render a person immune! Early recognition of the disease is the only hope of stamping it out entirely and by the education of the lay public to demand the now possible immunity. Diphtheria flourishes in winter, markedly declines in summer, any one can have it and have it more than once.

When the absorption of the toxin is rapid the damage caused brings death quickly before there have been any of the usual signs. Where the damage is confined to the breakdown of local tissues, it is unimportant if checked. The degenerative processes are those effects caused by severe local processes which were not enough to kill at once but which are the basis for the lesions

which cause the complications during the progress of the disease. The well-known "heart failure" or circulatory failure is due to the toxemia as in other infectious diseases, while the dilation of the heart, with rapid irregular pulse or heart block, are signs of lesions in the heart muscle caused by the toxin and if not anticipated and cared for early may result in death. Cardiac paralysis may occur in the first two weeks as the result of the damage done to the nerves supplying the cardiac center. The frequent paralysis of the palate is often the earliest damage recognized and will include the throat area, the voice will be queer and nasal, and the child be unable to swallow without aspirating food particles and fluids into the nose and pharynx and even the lungs, which may cause pneumonia. By the third week the paralysis may extend to the lower extremities. Albumin and casts in the urine will indicate kidney degeneration and sometimes constitutional symptoms of nephritis will occur.

Constitutional symptoms vary with the virulency of the organism and the location of the infection. As the toxic symptoms depend upon the absorption of the toxin, lesions located where absorption is poor or slow may produce few or no symptoms. Such is the case in *nasal diphtheria* where there may or may not be a membrane. There is usually a bloody acid secretion that causes excoriations around the nose and upper lip, otherwise the symptoms will be simply those of difficult nasal breathing.

When the membrane is limited to the *larynx,* symptoms of obstructed breathing are often pronounced and alarming. There may be few toxic symptoms if the membrane is limited as absorption from the laryngeal region is slight as compared to that from the pharynx and tonsils because these regions are far more vascular. The difficult breathing of *laryngeal* diphtheria is very characteristic. Because there is a true obstruction the difficulty is both inspiratory and expiratory and this should differentiate it from every other type of laryngitis. As the obstruction increases, the breathing becomes noisy or stridulous, at times there is added to the mechanical obstruction a spasmodic tightening which often becomes a complete closure of the larynx. This is often due to fear or to the pain of swallowing which increases the already alarming symptoms, the cyanosis increases, all the necessary muscles of reparation are called into play and if relief is not immediate death from suffocation or asphyxia results. Some of the most characteristic symptoms which should lead one to suspect laryngeal diphtheria are the brassy cough and loss of voice. It is difficult if not impossible to see the membrane. Coughing or vomiting bring up large or small chunks of

membrane which both macroscopically and microscopically are easy to determine. Cultures are too often negative, usually because of lack of care in taking the culture, it must be taken from deep down in the throat. In the majority of cases, however, there is extension of the membrane to the pharynx where it can be seen. Extension of the membrane into the large bronchi is usually overlooked and during life is often impossible to determine unless pneumonia develops. Pneumonia as a terminal complication is not uncommon and may be caused by any organism, streptococcus, pneumococcus, as well as the diphtheria bacillus. Laryngeal diphtheria must not be confused wih catarrhal laryngitis or croup. In every instance cultures should be taken and in cases where there is the slightest doubt it is far safer to give the antitoxin.

Antitoxin is produced by giving the horse gradually increasing doses of diphtheria toxin. Both the strength of the toxin and of the antitoxin can be measured very accurately. The guinea pig is the animal used for testing these. A minimal lethal dose (m. l. d.) of diphtheria toxin is the smallest amount of toxin that will kill an animal and a standard unit of antitoxin is the amount of antitoxin which will just neutralize and therefore prevent the killing of a guinea pig weighing 250 grams which has just received diphtheria toxin 100 times the m. l. d.

The injection of antitoxin of course only gives passive immunity, it remains in the circulation two or three weeks at the most and a given amount of antitoxin will only neutralize a definite amount of toxin—the giving of antitoxin does not stimulate the body cells to produce their own antitoxin, that is, active immunity.

Until 1913 passive immunization was the only way of protecting an exposed individual. It is still the only way to treat the disease. From 1896 to 1915 passive immunization had reduced the mortality from diphtheria 80 per cent. But since then the average mortality of about 10 per cent has not been reduced. During the last ten years *Schick* developed his test to determine whether an individual had immunity against an infection of diphtheria. The testing solution is a *fresh standard* (i.e., strength known) solution of diphtheria toxin which when ready for use will contain in 0.1 or 0.2 c.c., 1/50 of a minimum lethal dose for a 250 gram guinea pig. The New York Board of Health puts up a most reliable preparation. The diphtheria toxin is sealed in a capillary tube and when this is discharged into 10 c.c. of freshly prepared sterile normal salt solution or Ringer's solu-

tion—0.2 c.c. will contain exactly the 1/50 m. l. d. required for the following test.

An immune person will give no reactions (negative); when there is not sufficient antitoxin present for protection, a diffuse local reaction appears (positive) as a raised spot about an inch in diameter at the point of injection, pinkish or purplish in color, from within twelve hours to five days. The spot is indurated, hot and often tender, a very positive reaction may cause vesiculation and extension of the red areolar over the arm, and the axillary glands may become swollen and tender for 24 to 48 hours. In these cases headache, temperature and malaise may be present. As the spot fades a brownish pigmentation appears and there is a fine desquamation of the superficial epidermis. The pigmentation may last from a few weeks to several months.

Reactions are read at the end of 24 hours. This is the time when pseudo reactions are apt to appear. They are more irregular in outline, larger and more bluish than true reactions. They fade usually by the third day though they may last longer and cause both pigmentation and desquamation. To avoid confusing them with true reactions, a control reaction is done at the same time, using a toxin that has been destroyed by heat and using the other arm for the injection.

A positive reaction lasts from seven days to two weeks and the pigment and desquamation over a period of three to six weeks. It takes practical experience to differentiate between pseudo and positive reactions, but if control reactions are carried out there should be no confusion. The pseudo reactions will appear on both arms. An individual giving a combined positive and pseudo reaction should be considered as susceptible to diphtheria.

The susceptibility to diphtheria, according to the New York Board of Health, as shown by the Schick test, is about as follows: During the first three weeks only 15 per cent react positively, from three to six months about 30 per cent, from six months to three years about 60 per cent, from three to five years 40 per cent, five to ten years 30 per cent, ten to twenty years 20 per cent.

The use of this reaction and the application of the principle of *active immunity,* pointed out long ago by Theobald Smith, has now made it possible to eradicate diphtheria.

The toxin-antitoxin solution is now made up under Federal license; it is a sterile mixture of toxin and antitoxin in such proportions that the toxin is slightly under-neutralized. It is diluted in normal salt solutions so that 1 c.c. is a dose; it is given subcutaneously, usually just under the insertion of the

deltoid in the upper arm. Three doses at one-week to ten-day intervals is usually sufficient to stimulate the gradual development of immunity. For infants under one year, one-half the above dose is usually sufficient.

Once the immunity is developed, it is, as far as we know at present, retained. It takes from two to six months after the last injection to produce protective immunity. The Schick test after three or six months will determine the amount of immunity. A few persons have to receive more than one course of toxin-antitoxin (T. A. T.) injections for protection. Practically no infants or children under three and only a very few under six years have any reactions from the T. A. T. injections, whereas older children may have mild reactions, and adults will have quite marked local and general reactions. For this reason a safe rule to adopt is to give the T. A. T. to all children between six months and six years without a Schick test and from six years to twelve years only to those who react positively to a Schick test. (Adults, especially doctors and nurses constantly in contact with diphtheria, should be *Shicked* and the positive ones given T. A. T.)

The dosage of antitoxin varies from 500 to 1,000 units as a prophylactic dose, in mild cases or where it is given early (first 24 hours) from 2,000 to 4,000 units, where there has been a longer delay or the symptoms or the membrane are moderately developed 4,000 to 10,000 units, in severe cases from 5,000 to 20,000 units or even more in malignant or rapidly developing conditions.

The **method of giving antitoxin** varies with the symptoms; for quick results, that is, neutralization, the intravenous route should be selected. In other cases the intramuscular, and only in the very mildest cases or when given as a prophylactic is the subcutaneous route to be used.

The results of a treatment are visible in a few hours, the membrane stops spreading and the edges begin to curl and in 12 to 24 hours begin to disappear by softening or peeling off, leaving no bleeding base; great pieces are coughed or spit up. The edema lessens, the temperature, pulse, appetite and activity all return rapidly to normal. This will all depend upon the severity of the case, how often and at what intervals and in what amounts the antitoxin has been given. The accuracy of the interpretation of symptoms will determine this, and it is better to give more antitoxin than actually needed than too little. The dangers of antitoxin are often exaggerated. Certain precautions should rightly be taken. When the intravenous route is indicated, the patient should be tested for sensitiveness to foreign proteins and

if sensitive should be desensitized by giving a small amount (1/20 c.c.) subcutaneously, then waiting 10 minutes and if no symptoms develop double the dose; as the dose increases the interval between immunizing doses is increased, gradually the patient becomes desensitized and the whole antitoxin dose may be given intravenously. Where there is a history of asthma or where the patient has received an injection of serum before, these same precautions are necessary; in young children they are seldom necessary.

Urticaria and **joint pains** sometimes occur but are annoying, **not** important. Sponging with soda bicarbonate or bran water, or adrenalin given subcutaneously, will usually give marked relief, and the conditions disappear in a few hours or days at the most.

Convalescence from diphtheria should be slow, even in mild cases two weeks in bed is none too short, where there have been toxic symptoms, but in cardiac symptoms or paralysis three or four weeks is imperative. When any myocardial symptoms appear, and it must be remembered they do not appear for several weeks, the date of convalescence must not begin until all symptoms have cleared up, the heart becomes regular and paralyses entirely disappear. Even moderate activity should not be allowed for a month or two, and when a beginning is made it should be very gradually increased.

Other Forms of Treatment. There is very little difference in the treatment of special symptoms arising in diphtheria from those in other acute infectious diseases except in the case of laryngeal diphtheria. Here intubation or tracheotomy may be necessary and should not be delayed when there are increasing symptoms of obstruction. In most cases the introduction of an O'Dwyer tube of the right size will give immediate relief. In the preparation for an intubation, the head must be extended by placing padding under the neck or extending over the edge of the table—the child may be lying down or sitting up, whichever the operator prefers—the child must be wrapped in a "mummy sheet," the mouth gag is inserted at the left side of the mouth. All emergency hypodermics and the tracheotomy set should be in readiness before starting. When once the tube is in place the child will breathe deeply, the cyanosis will disappear and often the exhausted child will fall into a deep sleep. The tube may be easily and frequently dislodged, it should be removed at the end of four days. It may have to be replaced once or at the most twice at four-days intervals. Tubes are seldom necessary for longer periods.

In dismissing a patient, three negative cultures taken on successive or alternate days is the requirement of most boards of health. This requirement is often exasperating to a family, but it is absolutely necessary as a public health measure in limiting the spread of the disease.

Another very difficult problem is the "carrier." Where the carrier is found to have virulent diphtheria organisms, isolation until their disappearance or until they become non-virulent seems often a cruel hardship, but it is a necessary one.

Nurses and doctors in constant attendance upon diphtheria should take all the precautions to prevent becoming carriers, wearing masks is perhaps the most satisfactory, mouth washes or gargles are of little value in clearing up a carrier—of what value they are in preventing one is problematical, but it is worth trying until we have eradicated this disease as we practically have done with typhoid fever.

6. **Mumps**—Epidemic Parotitis. Mumps has held a rather insignificant place in the consideration of infectious diseases. This is due to the very low mortality. However, if considered from the new standpoint of economic loss due to the disease, mumps becomes of real importance to industry or to an army. In one military camp during a short epidemic of mumps, the cost to the United States War Department in time lost by disabled men was over one million dollars. This loss is purely one of disability and does not express the factor of sterility produced by the most frequent complication, orchitis. During the past few years we have gained some knowledge of the infective agent in mumps, and this knowledge always enlarges our conception of a disease and opens up new problems for study and consideration.

Definition. Mumps is one of the most common of the infectious diseases, though one of the most benign. It is one of the most contagious diseases, provided a group of susceptible individuals is brought close enough to the infection. This was amply demonstrated during the past five years of the war in the army camps, especially those composed of men from the rural communities. Under ordinary circumstances epidemics are not so frequent with the exception of institutional children where conditions exist for spreading the contagion. Mumps commonly appears among children between five and fifteen years of age. White gives the history of a case in a new-born baby which, on account of the presence of an epidemic in the neighborhood, would look like an antenatal infection. No age is exempt, still under normal conditions of life there is no doubt of the more

marked prevalence of mumps in the early adolescent years. The infection usually shows itself first by a swelling of the parotid glands, though any wall of the salivary glands may be the starting point of the infection; or it may develop first in the testicles.

The organism responsible for mumps is unknown though many organisms have been described. The disease is said to be communicable during the incubation period which is from three or four days to three weeks.

Symptoms. The onset of mumps is generally characterized by a slight amount of pain or stiffness at the angle of the jaw, noticed first in biting or chewing. Usually there is loss of appetite, at times a feeling of nausea and vomiting in the severe cases, headache, pain in the legs and back. Temperature varies from 99 degrees to 101 degrees, in severe cases reaching 104 degrees and 105 degrees, with marked central nervous disturbances. Within 24 hours the swelling of the parotid glands, one or both, is normally noted. The lobe of the ear is pushed upward and may extend almost horizontally. This gives the patient the typical appearance and in itself is almost pathognomonic of parotitis. The swelling may extend upward to the orbit, almost closing the eye, and frequently the conjunctiva is inflamed. The whole cheek seems swollen and the swelling may extend into the neck as low as the clavicle. When the swelling is present on both sides in the neck, it gives the neck a very broad appearance. Inspection of the mouth usually reveals nothing abnormal except the orifices of Stenson's duct pout slightly and are surrounded by a pinkish area. The mouth of the duct may be opened, though the lumen is obstructed by the swelling. The mouth is usually dry and taste is often diminished. Sour or acid foods will cause pain or cramp in the angle of the jaw. In the uncomplicated cases, the temperature which runs an irregular course lasts for two or three days, subsiding usually before the swelling of the parotid has disappeared. In simple cases, it is difficult to keep a child in bed, although he is better off there if there is the slightest temperature. Some children will suffer practically no pain or discomfort. Others will run high temperatures and be very uncomfortable. When there is great swelling and pain, swallowing is very difficult and feeding very small children with mumps may present some temporary problems. Such acute symptoms seldom last longer than two or three days, and the fever and exhaustion subside rapidly. In most cases the swelling and all other symptoms have entirely disappeared by the tenth day.

Complications. The frequent involvement of the sub-maxillary and salivary glands together with the parotids is not a true complication. Few children suffer from real complications, although in adults the inflammation may occur in other parts of the body, such as the uterus, ovaries, breasts or external genitalia of the female, or in the testicles of the male (orchitis). This latter is more frequent and often produces a sterility. Otitis media is a possible but not frequent complication, and any of these complications are usually prevented if the patient who is really severely affected is kept quietly in bed for at least three weeks after the onset.

Treatment of mumps consists almost entirely in nursing care and watchfulness to prevent complications. Liquid food for the first few days is more comfortable for the patient and avoidance of acid articles of food will lessen the local pain in jaws and glands. Keep a child warm and comfortable in bed as long as there is any temperature, and away from other children for three weeks from the onset and longer if the local swelling has persisted for two weeks or more. The diagnosis of mumps is easily made from the characteristic picture of the swelling of the parotid glands, and the normal progress of the disease.

7. Varicella—Chicken Pox. This is one of the most acute contagious diseases of childhood. It is not usually severe in the course and sequelæ or complications are rare although erysipelas, nephritis and pneumonia may all occur with the disease. It is best never to minimize the dangers of any mild infectious disease when caring for a sick child as the step from minor to major difficulties is always such a short one. When chicken pox becomes epidemic in school or hospital it causes a great deal of expense in the loss of time and energy given to the strict quarantine necessary to avoid spreading the disease to others, and may often in hospital care postpone necessary surgical procedure. The incubation period being variable, from sometimes four days to three weeks, and the disease being acutely contagious from the moment the lesions appear until they disappear, chicken pox control becomes more than a slight inconvenience to an individual or family.

Symptoms. Chicken pox commonly begins with a rash on face, body and later the extremities, without usually any sign or complaint of temperature. High temperature or convlusions are rare. The typical chicken pox lesion is first a single macule or red spot, upon this a small purple papule piles up and at last a raised sac or vesicle filled with clear fluid. This development takes place quickly and by the first 24 hours the vesicle may

be 3 or 4 mm. in diameter. In three or four days these vesicles with their surrounding reddened areas have spread over the entire body. These vesicles dry up like flat crusts and fall off within three weeks.

The body eruption will show all stages of the lesions on a single area of skin as they make their appearance as successive crops and do not all reach the same maturity, owing no doubt to the growing immunity in the patient. The lesions of chicken pox may appear in the mucous membranes of the mouth and vagina as greyish white spots ringed with a red area.

While the exact nature of the virus is unknown, vesicles and the resulting dry crusts harbor it and quarantine must continue until all crusts are off.

Differential Diagnosis. Chicken pox has a certain significance from the point of view of the public. It must not be mistaken for smallpox nor must mild smallpox be diagnosed as chicken pox. The lesion of smallpox is distinctly different from the varicella lesion, there is but one crop, a uniform stage of development and the lesions are found chiefly on hands, face and exposed extremities. Chicken pox always spreads mainly over the trunk. The usual smallpox has a severe onset. The danger of mistaken diagnosis lies with the mild case.

The treatment of varicella is the usual nursing asepsis, the rigid isolation and quarantine, with the ordinary hygienic methods of relieving and preventing the itching and scratching of the lesions by ointments and protection.

8. Smallpox—Variola. This old disease recognized for *hundreds* of years and controlled for about *one* hundred years is still of unknown etiology. That it is an intensely communicable disease, and a disease of high mortality has made the enforcement of protective vaccination easier, and where vaccination is rigidly practiced beginning with all children three months of age, epidemics are unknown and not a single case of smallpox will ever appear. The unvaccinated child is the usual victim.

The usual incubation period for smallpox is fourteen days though cases have been reported with shorter and longer periods. The onset is usually sudden with headache, backache, vomiting, chills, high temperature and later skin eruption. The typical "pocks" or lesions develops as follows: By the third day the body will be covered with a blush or redness followed on the fourth day by a definite petechial rash in the form of just red spots or macules in the forehead, wrists and abdomen spreading rapidly. The macules become pimples or papules by the fourth or fifth day, getting to be 3 or 4 mm. in diameter with the center

depressed. This center deepens and fills with fluid and we have the typical vesicle, the fluid in which by the eighth or ninth day has become purulent and we have the loathsome pustule of smallpox, the typical smallpox picture of swollen eyelids and face, thickened lips, and even the mouth filled with lesions cannot be mistaken. By the twelfth or fourteenth day the pustules begin to dry up and form crusts which fall off. If the lesions have been very deep on hands or face and have run together much actual destruction of tissue may result. The treatment will be considered under vaccination.

9. **Vaccina** (cowpox, horsepox, sheeppox) is generally believed to be the same disease in animals as smallpox in man, and which may be given to man. In man, however, vaccina will be confined to local pustules developing from contact of some kind. This finding was really the basis for Jenner's vaccination theory. He knew that inoculation of man by applying the virus from a pustule to the skin or mucous surface of a healthy person and thus producing a much milder type of smallpox had been practiced in different countries for centuries. When observation made certain that persons who had cowpox were apparently immune to smallpox, Jenner accomplished the conferring of immunity from smallpox by vaccinating with the virus from pustules of cowpox. Jenner thought that one vaccination conferred permanent immunity but time has proved the necessity of revaccination for many persons.

Vaccination is the process then of inoculating persons with smallpox virus which has been passed through calves. A successful "take" runs the same course as described in the section on smallpox lesions, as it is practically identical. The area around the lesion may be very red and swollen and some persons will have temperature and the usual symptons of the onset of smallpox though usually very mild in form.

The *method* of *vaccination* followed with good results may be briefly stated. Wash the area of skin to be vaccinated thoroughly with soap and water followed by 70 per cent alcohol. The outer surface of the upper arm or the inner surface of the calf or thigh are satisfactory sites, the latter being used for girls to avoid scarring the arm. When the area is made absolutely clean and is dry, two superficial abrasions close together are made and the vaccine rubbed thoroughly into these abrasions with the end of the sterile needle. When the area is dry it may be covered with a sterile gauze. The scarification should not be deep enough to draw the blood but only a slight oozing of lymph. The vaccine used should always be fresh, having been

kept at low temperature until use. This protection is necessary in order to prevent accidents in the use of the virus. The United States Public Health Service has definite regulations for the production of vaccine virus which are designed to eliminate the presence of other harmful bacteria, such as tetanus bacillus.

Dressing a Vaccination "take." A vaccination would demand the same asepsis as any other wound and every care should be taken to avoid infecting the area. Plain gauze dressings held in place by adhesive tape should cover the pustule but should in no way bind the arm which is usually slightly swollen. The slight oozing will cause the first gauze dressing to stick and it is best not to attempt to remove the gauze but change the part of the dressing that is free by cutting it away and leaving alone the gauze stuck to the actual lesion. Fresh dressing can be put on over this. The object is to avoid touching the vaccine abrasion or lesion. A shield should not be used.

If a vaccination does not "take," immunity must not be the immediate conclusion. The vaccine may not have been fresh and therefore had lost its potency, or it may have been kept at too high a temperature or there may have been a slip in the actual technique of vaccination. When such possibilities have been definitely eliminated, then immunity from a previous vaccination is safe to assume. The vaccination will then be merely a small reddened raised spot that will disappear in a very short time. If it is a primary vaccination it is safer to repeat the vaccination even though the primary one has been done under ideal conditions of virus and technique as everyone should have protection. A thriving baby may be vaccinated by the time he is three months old. It will cause little disturbance then, and it should be repeated again in five to seven years and always in the presence of an epidemic. The protective substances in the blood which are able to successfully fight the virus of smallpox appear about eight or nine days after vaccination; the incubation period for smallpox being in general about fourteen days, vaccination soon after exposure to the disease stands a good chance of giving protection.

10. **Typhoid.** Typhoid to-day is comparatively rare in infancy and childhood. It was never a very common disease, though occurring more often than older textbooks indicated, because typhoid in infancy and childhood was a mild disease. Typhoid now appears usually during epidemics from contaminated milk or water. The reduction of typhoid is the great triumph in sanitary engineering and public health work. Modern methods of purifying water and preventing its contamination,

and of handling milk and raw foods, are responsible for this reduction.

The etiology is, of course, some one of the typhoid bacilli. The typhoid family is a large one and connected with it is the less virulent para typhoid family. These various members can be differentiated only on special media and by their agglutination reaction. The common test is the Widal agglutination reaction where the patient's blood contains agglutinating substances for the typhoid bacillus. This laboratory method has made the diagnosis fairly simple and accurate, but it is only of value after the tenth day of sickness, as it takes about that length of time to develop the typhoid antibodies in the child's blood. In the first few days of typhoid, blood cultures will often show the presence of the typhoid bacillus. This fact has proved that typhoid is, at first, a general infection and only secondarily localized in the intestinal tract. Symptoms therefore are at first general with fever and prostration. Nervous symptoms in young children are apt to be severe. The intestinal symptoms are often mild and difficult to distinguish from a simple gastro-intestinal infection. Diarrhea and vomiting may or may not be present. Constipation may be the chief symptom with more or less distention of the abdomen (tympanites).

The characteristic eruption (rose spots) is not as constant or as abundant in children as in adults. It usually appears at the end of the second week, and a few days before it appears the spleen will begin to enlarge.

The characteristic temperature is less often found in infants and children than in adults. The typical temperature curve rises gradually during the first week, then remains constant within a degree or two for a week, and then gradually comes down to normal during the third week. In infants and children the rise in temperature the first week may be more abrupt, the oscillations at the height may extend over a greater number of degrees and descend to normal more rapidly. The increase in pulse rate, the changes in the urine, and the characteristic blood picture are all about the same in children as in adults.

The complications of intestinal hemorrhage and perforation are rather rare. Upper respiratory tract infections may be present but usually not in a severe form. Nervous complications, though not common, are often very serious. Among these are chorea, aphasia, and meningitis.

Due to the fact that typhoid runs such an irregular course, laboratory methods of diagnosis are necessary to distinguish typhoid from other diseases which run irregular courses in infancy and childhood, such as malaria, dysentery, tuberculosis,

and early tuberculous meningitis. This procedure for the diagnosis is true for the isolated cases. In an epidemic of typhoid, a presumptive diagnosis can be made without the laboratory test.

Treatment. There is no specific treatment for typhoid. The child should be kept in bed during the temperature period, no matter how mild the symptoms may be. A liberal diet of liquids and non-coarse foods, such as pureed vegetables, cereals, eggs, ice cream, milk, fruit juices, with plenty of water, should be given. Food at frequent intervals is better than the three-meal schedule. Five feedings at four-hour intervals is more successful. The urine and stools should be disinfected immediately by strong bichloride or carbolic solutions. The bed linen and towels and night clothes should be kept separate and sterilized. Urotropine is often given to disinfect the urine. This drug is only effective when the urine is acid, because only in an acid reaction is the formaldehyde liberated to kill the typhoid bacilli. Other symptoms, such as diarrhea, constipation, or high temperature, are treated symptomatically.

Prophylactic Treatment. Typhoid vaccination should be recommended for children who are traveling or who are moving from a district where sanitation is complete to districts where sanitation is lacking. Boiling all liquids (milk and water) and cooking all raw foods, such as fruit, vegetables, etc., in districts where sanitation is unknown, would prevent most accidental cases of typhoid. At the present time, most of the cases of typhoid follow poorly organized summer resorts and camping parties. Vaccine treatment should not be undertaken when the presence of typhoid is suspected in an individual, because vaccination during the beginning of the disease often produces severe reactions and does not divert the typhoid infection from its regular course.

11. **Malaria** is another preventable disease, the freedom from which modern sanitation and public health have made purchasable for any community. This is true because we know the etiological factor of malaria which is the plasmodium that can only be carried by the bite of an anopheles mosquito. Malaria still exists in the South and in certain Western areas where constant drainage of stagnant water pools is not carried on but are left to breed the malarial mosquito. But, gradually, modern methods are invading these areas and malaria should grow less and less frequent.

Malaria may attack any age from the newborn baby to old age, but it is less likely to be suspected in infancy and childhood because it runs an irregular course. There are three types of

malaria found, and, in order of frequency, they are the *tertian,* the *estivo-autumnal,* and the *quartan.* In the *tertian* malaria, the chill and temperature rise occur every third day. In estivo-autumnal, the chill and temperature are irregular. In the quartan malaria, the chills and temperature may appear every fourth day. But there are so many opportunities in all these forms to have double infections that, except in a simple tertian infection, there is more apt to be an irregular sequence of chills and temperature than regular. But to be exact and Irish, there is, even in these irregularities, a tendency to be regular in them!

Symptoms. The onset of malaria is usually accompanied with a chilly feeling, if not an actual chill, vomiting, headaches, and general pains. The younger the child the less evident are the general symptoms. This is called the "cold" stage. The cold stage is followed by the hot stage in which the temperature rises rapidly. The hot stage is followed by sweating. If the infection has lasted any length of time, there is marked anemia, with a peculiar yellowish pallor. An enlarged spleen usually accompanies this condition. In the milder forms of malaria, the blood examinations should be made just before the paroxysm begins. In the more severe cases blood examinations at any time will show plasmodium in different stages of development.

Diagnosis. Malaria used to be a frequent diagnosis when it did not even exist. Now, fortunately, laboratory examinations give the positive diagnosis by showing the presence of plasmodium. In the same way, almost all of these irregular and indefinite temperatures that used to be grouped as malaria may be positively differentiated into specific conditions, such as pyelitis, by urine examinations, or anemia or leukemia by differential blood counts.

Treatment. There is one drug which is practically a specific, quinine. This drug may usually be given satisfactorily by mouth, but, if it causes vomiting, it may have to be given by rectum, or in severe cases it may be best to give it hypodermically. In a malarial region, such as the tropics or sub-tropics, quinine is frequently used as almost a household remedy. The bitter taste may be disguised with chocolate or with fruit syrups. Infants and children usually need fairly large doses of quinine, and children from five to ten years may need the same dosage as adults to control the infection. After the attack is over, if it has been a long one, the child, though cured of malaria, is by no means well. He will still show the signs of anemia and the general results of the infection, like muscular weakness or malaise, which may last for some time and which demands convalescent care. Iron and arsenic tonics are often given for the

anemia. Change in climate, proper diet and hygiene, the whole general regimen of the child are more important than any drug or tonic.

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CHAPTER IX

TUBERCULOSIS

1. General Consideration. The more the subject of tuberculosis is studied the more certain it seems that a clear definition should be made of the difference between infection and disease. When we see statistics stating that 80 per cent to 90 per cent of children have tuberculosis by the time they are fourteen years of age, this must mean *tuberculous infection* and *not* tuberculous disease. We know that infection is very prevalent in children but infection, fortunately, does not mean disease. It simply means that somewhere the tubercle bacilli have gained entrance and have found a definite lodging place usually in some group of glands, as the cervical or bronchial glands. Here the tubercle bacilli may remain dormant for years producing no symptoms or any general systemic reactions. This fact makes the problem of early tuberculous infection more important and our conception of these primary infections has changed radically during the past few years. Among students of tuberculosis there are now recognized three fairly definite stages or periods through which the average tuberculous case proceeds. (1) The primary infection in tuberculosis, as in syphilis, is an infection of the regionary lymph glands which as a secondary process (2) spreads to neighboring structures by direct connection as the peribronchial tissue from the bronchial glands and (3) what is now spoken of as tuberculosis, is really the tertiary form of tuberculosis and occurs often years after the primary infection, spreading diffusely not only to neighboring structures but often to far removed organs, and has a tendency which the other two stages do not have, of producing cavities. The majority of primary infections run a chronic course rather than an acute, except those occurring in the first two years of life.

The von Pirquet reaction will show the presence of infection but that does not necessarily mean disease, a point to be remembered in considering the value of the von Pirquet reaction. (Figs. 117-118.)

Careful surveys with the tuberculin reaction on children from one to seven years of age at Framingham, Massachusetts, have shown that 33 per cent give positive von Pirquet reactions by the seventh year; 32 per cent boys and 35 per cent girls. When the

children enter school this percentage increases to 38 per cent for boys and 55 per cent for girls. There is not only a sex difference but a racial difference; Americans 18 per cent, Jews 30 per cent, Irish 30 per cent and Italians 51 per cent. These studies have brought out the fact that the tuberculin reaction measures the resistance of the child to tuberculous infection and perhaps to the disease itself. In most of these cases with positive reaction, clinical signs of the disease were absent. Martha Wollstein at the Babies Hospital in New York, out of 185 autopsies of children found the following percentages of tuberculous lesions:

FIG. 117.—Method of doing von Pirquet test on arm.

1.8 per cent of all infants under three months, tuberculous lesions.

12 per cent of all infants under one year, tuberculous lesions.

36 per cent of all infants between one and two years, tuberculous lesions.

32 per cent of all infants over two years, tuberculous lesions.

Groups:

1. Those showing pulmonary lesions only four cases.
2. Those showing bronchial lymph node lesions only one case.
3. Those showing bronchial lymph node and pulmonary lesions only thirteen cases.

4. Those showing bronchial lymph node and pulmonary lesions most advanced lesions of a generalized tuberculosis.

5, 6, 7. Mesenteric, etc., Lungs involved in 96 per cent of all cases. Only five cases of intestinal lesions with ten of intestinal origin but generalized.

Tuberculous disease has varying manifestations, depending on the age of the child. Infection in the first year very often leads to disease. Statistics show that about 80 per cent of the children

Fig. 118.—Von Pirquet tuberculin skin reaction showing control as the lower black dot; bovine, moderately positive; the top one—human and strongly positive.

who are infected in the first year of life, sooner or later have the disease, and a large percentage of these die, either from general miliary tuberculosis or from miliary tuberculosis and tubercular meningitis, as an accompanying manifestation of the widespread tuberculosis process. Tuberculous disease in the first two years is a very serious and fatal condition. Fortunately, it is easier to limit infection during these first two years than later because contact with tuberculous individuals can be definitely regulated

during this period and milk from tuberculous cattle can be controlled and these are the two main sources of infection.

Every doctor and nurse in charge of a little child suffering from any form of tuberculosis must make every effort to discover the *source* of the infection. The search for the tuberculous person often overlooks the servants in the house and over and over again servants are found in healthy families spreading this disease amongst the little children. The family history surrounding the case must include the cook, the maid, the laundress, everybody to whom a little child in a family naturally will run to for loving and petting. This country is filled with servants from European countries whose hygienic standards are low, and who, though robust looking and for a time often very strong, will develop tuberculosis very quickly under the conditions of domestic service which prevails in many parts of our country; a small often dark room with tightly closed windows and one afternoon a week out is fertile soil for the development of tuberculosis.

The **symptoms** of tuberculous disease in infancy are often very difficult to determine. They usually are associated with loss of appetite or loss in weight, and no definite localizing symptoms until very late, when in a large proportion of cases of miliary tuberculosis, meningeal symptons appear.

2. **Miliary tuberculosis** is always fatal and is due to the breaking down of an already infected lymph gland or primarily to an overwhelming infection as when directly infected by contact with a mother or nurse with an open acute pulmonary tuberculosis (Fig. 119). The small tubercles are spread by the lymph or blood stream to all parts of the body. There are practically no symptoms unless the infection reaches the meninges as it very frequently does thereby producing tuberculous meningitis. The infant usually runs a moderate temperature for which no explanation can be found in the physical examination. As the condition progresses there may be a few signs in the lungs, or the spleen may become enlarged. Gradual progressive emaciation is the rule, with few or no digestive symptoms. The infant just seems to be unable to digest any formula or even breast milk and fades away irrespective of the food given it. The tuberculin test, either Pirquet, dermal or the intradermal are frequently negative. The X-ray will, if the lungs are involved, show the characteristic picture—a pepper and salt appearance, the miliary areas can be seen as small white seedlike shadows throughout the lungs. Intercurrent infections often obscure the true condition and often one does not suspect the presence of tuberculosis until the meningitis develops. If

infants are to be saved, the detection of tuberculosis must be made long before it becomes miliary tuberculosis when treatment does nothing.

3. Tuberculous Meningitis. It has been stated that tuberculous meningitis is fifteen times more prevalent in infants coming from tuberculous families than in infants coming from non-tuberculous families. This is undoubtedly true and the more one comes into contact with tuberculous families the more one is impressed with the frequency of tuberculous meningitis in these families if there are any children below five years of age.

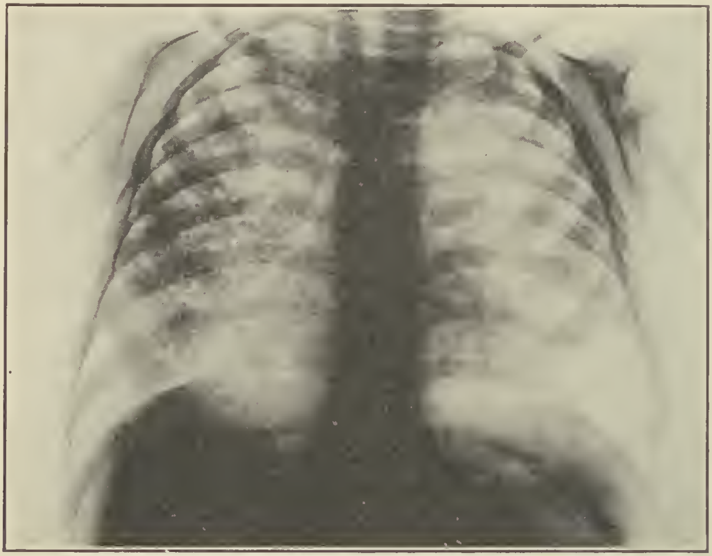

FIG. 119.—X-ray picture of Miliary Tuberculosis with areas of consolidation scattered over right chest.

The average age of all children having tuberculous meningitis in the University Hospital has been three years and four months. It rarely occurs after five years, though occasionally cases occur in considerably older children. The family history, therefore, is one of the most important details in the consideration of early tuberculosis.

(Chart 16) The early symptomatology of tuberculous meningitis is that of general tuberculosis, loss of appetite followed by more or less rapid loss of weight. The tissue turgor is very rapidly diminished, early changes in disposition are frequent. The child becomes irritable, wants to be held where previously it was content to play by itself. Changes in the general circulation

are also quite noticeable, rapid flushing and paling of the cheeks. At times the hands and feet are cold and at other times the circulation appears to be fairly normal. Usually they run an irregular temperature, though not a high temperature during the early stage. Other general symptoms may relate to the gastro-intestinal tract. Vomiting and diarrhea are not infrequent. Following the loss of weight and the diminution of tissue turgor, sweating is frequently noticed, though this is not a characteristic symptom. The child seems not only to be irritable but at times complains of pain on muscular action. Older children usually complain of persistent headache. The cough is at times quite characteristic, sharp, rather brassy and persistent, which is due to irritation from enlarged bronchial glands. Repeated colds and bronchitis are not unusual in older children though in infants there is usually little or no history of upper respiratory tract infection.

The first signs of meningitis often make their appearance simultaneously so as to give the general impression of a sudden onset. Usually the history of anorexia, loss of weight and change in disposition is obtained after the history of symptoms which relate to the central nervous system. Sometimes the onset is stormy, convulsions being the first indication of a serious condition. More often the child becomes somnolent or even passes into an unconscious stupor with a moderate amount of rigidity which is more marked in the neck muscles. Convulsions usually appear during the course of the disease but are more often late than early. Delirium in older children is also a later finding. Hemoplegia, or paraphlegia may be a fairly early symptom. (Fig. 120.) It is quite confusing when present and at different examinations the extent of paralysis seems to vary. Generalized tremors are probably more frequent than are convulsions and at times have the appearance of a tetanoid condition. Changes in the pupils are very frequent, and are an early symptom of the basilar involvement. Unequal pupils with strabismus is probably the most frequent combination. The pupils usually react to light very sluggishly. Nystagmus is often seen as is ptosis. Involvement of the respiratory center, with change in type of respirations is usually a late symptom. Sighing respirations and Cheyne-Stokes type of respirations are very common toward the close. One of the most characteristic features is the changeability of the reflexes. Kernig's sign is always demonstrable in any given case, but by no means demonstrable at any time. It will be present at one examination and not at another. The same is true of Oppenheim's, Trousseau's and Babinski's reactions. The only reaction which is very constant is Brudzinski's sign or the

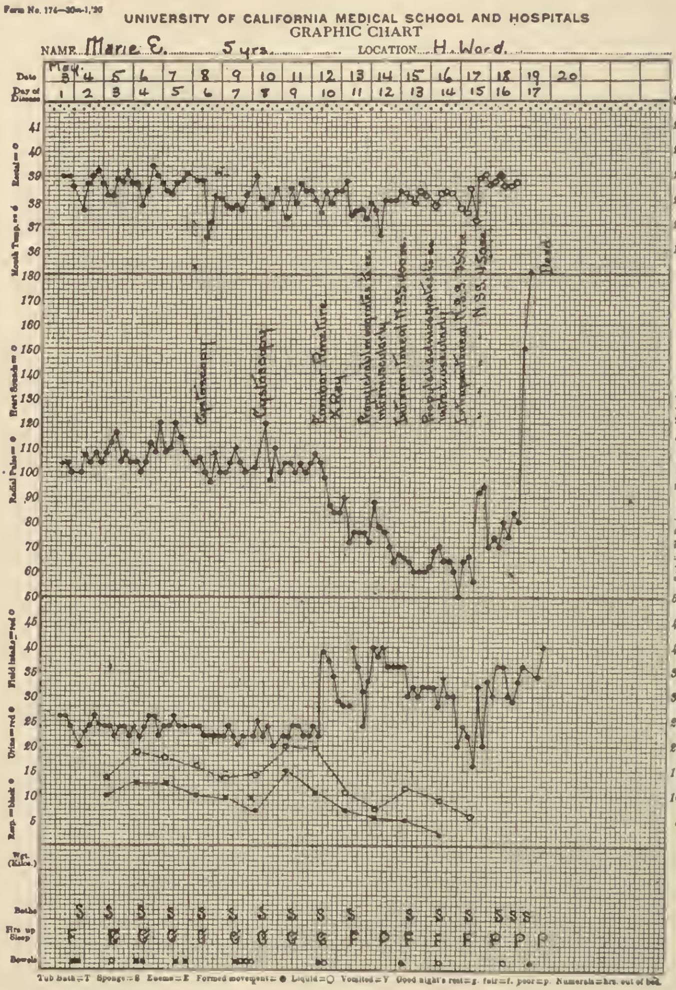

CHART 16.

Legend for

Marie E. (Hospital No. 14692)

Age: 5 years.
Diagnosis: Military tuberculosis, tuberculous meningitis, tuberculosis of the kidney.

She was admitted into the hospital because of pain in the right side of her abdomen, for temperature and loss of appetite. Her family history was negative as first obtained and every member of the family was healthy. She had always lived an out-of-door life and had been brought up in the country. One month before admission she began to have occasional attacks of pain in the right side of the abdomen. She had no difficulty in urinating though the frequency of urination had been diminished. Occasionally the

neck sign and more or less general rigidity of the neck and spine.

The physical examination in infants may be entirely negative beyond some of the rather generalized findings of emaciation, loss of tissue turgor and the presence of glandular enlargement. The cervical, axillary and inguinal glands are usually only moderately enlarged. The bronchial glands, however, can always be made out by percussion and often there is definite change in the breath sounds, being more bronchial over the areas of the glands. On account of the condition of the child, voice sign—D'Espine's—and fremitus cannot usually be elicited. When there has been a peritoneal involvement the definite signs of enlarged abdomen, either with fluid or with matting of the peritoneum and enlarged glands can be demonstrated. This is, of course, also true of cases which have a definitely localized tuberculous process as Pott's disease or tuberculosis of the hip.

The von Pirquet reaction is, of course, a positive indication that tuberculosis is present. In infancy, it is a very important positive finding. A negative finding, however, should not influence one too strongly. In my experience I have been able to demonstrate it in between 60 and 80 per cent of cases in different series that I have studied. The ability to demonstrate it depends on the condition of the case when first seen. In far advanced cases it very often is negative. I have been able to demonstrate it early and then later have it disappear in the course of the disease. In older children a positive reaction is only a sug-

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pain was so severe that she vomited. During the last ten days she had a temperature which ranged between 38°C. (100°F.) and 39°C. (102°F.). Her highest recorded temperature before admission was 102.5°F. (39.2°C.). She became quite fussy and wakeful at night. She had perspired a good deal about the head. Her physical examination on admission was practically negative except for some tenderness over the right kidney.

The urine, on examination, showed a large quantity of pus and was at first diagnosed as acute pyelitis. However, the culture of the urine was negative. Careful examination of the sediment of the urine showed tubercle bacilli to be present. X-rays were then taken which showed a miliary tuberculosis of the lungs. Three days later or ten days after admission, she showed her first signs of beginning meningitis by occasional diplopia or double vision. Spinal puncture at this time showed an increased amount of fluid with increased cell count of the mononuclear type. From this time on she developed definite signs of meningeal irritation and during the last three days was semiconscious with slight general twitchings.

The marked rise in pulse and respiration with only a moderate rise in temperature during the final hours is not uncommon though very often there is also a marked rise in temperature. Tubercle bacilli were also found in the spinal fluid.

Careful study of the family history disclosed the fact that there was a nurse maid in the family who had an active case of tuberculosis. The family had thought she had "only a slight cough." On examination her sputum was found to be loaded with tubercle bacilli. She had been caring not only for the child who died but for two other children, both of whom on examination showed signs of having contracted the infection.

gestive finding when there are meningeal symptoms. Without a very definite history or physical findings, as well as very suggestive or positive spinal fluid, it should not weigh too strongly in making a positive diagnosis of tuberculous meningitis.

The most positive means of diagnosis is examination of the spinal fluid. (Fig. 121.) However, even this, unless the tubercle bacilli are found, is not positive by itself, though taken with the other findings, it becomes most significant. The spinal fluid of tuberculous meningitis is increased in amount, it is clear to

Fig. 120.—Facial paralysis from tuberculous mastoid involvement. (This child developed tuberculous meningitis and died.)

opalescent and is under moderate pressure. A fibrin clot is always present if the fluid is allowed to stand quietly for a short time. A characteristic spiderweb clot appears in most cases. The amount of sugar normally present is either markedly reduced or has disappeared entirely. This is shown by Fehling's test, there being either no reduction of the copper sulphate or the reduction is considerably less than normal. Albumin (Nonne reaction) and globulin (Noguchi reaction) are both increased, often quite markedly.

The cytology is quite characteristic. Cells are always increased above normal and in the majority of cases, the lymph-

ocytes predominate from 85 to 100 per cent (in our series 86 per cent). In acute cases, however, it is possible early to have quite a high percentage of polymorphonuclear cells. I have seen them in acute fulminating cases in larger percentage than

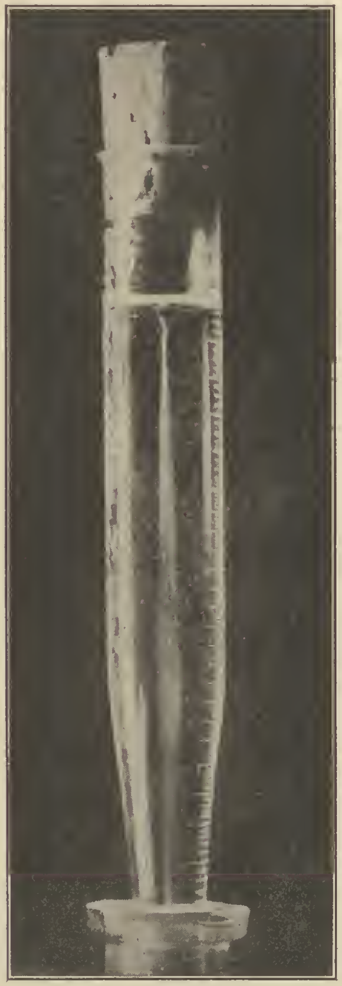


FIG. 121.—Cobweb fibrin clot in spinal fluid from tuberculous meningitis.

mononuclears. The tubercle bacillus can always be demonstrated by careful examination. At times, it seems almost impossible to find the bacilli in a single specimen, though we have always been able to demonstrate its presence where several successive lumbar punctures were examined.

Guinea pig inoculation of 5 to 10 c.c. of spinal fluid if introduced peritoneally always produces tuberculosis in the guinea pig in the course of from six week to two months and in cases where only one specimen of spinal fluid is obtainable and there is no autopsy granted, this is often the only way an absolutely positive diagnosis can be done.

There is only one outcome to tuberculous meningitis as I have seen it and that is death. There have been several writers both in this country and abroad, who have claimed to have had cases of tuberculous meningitis recover but from a careful study of their reported material and from a wide acquaintance with spinal

FIG. 122.—Gross section of an omentum field studded with large lymph nodes. The coils of the intestine can be seen. (From the National Pathological and Anatomical Museum, University Institutes, Wien.)

fluid examinations the possibility of mistaken diagnosis is more than probable.

4. **Tuberculous Peritonitis** (Fig. 122). If the infection starts from peritoneal glands we have symptoms pointing to the abdomen and intestinal tract with increased size of the abdomen. Tuberculosis peritonitis rarely starts as a primary lesion of tuberculosis but is usually secondary to tuberculosis of the intestine, or of the mesenteric glands or intestinal ulceration or even lesions in distant organs. The disease if discovered early and treated properly should not have a high mortality. Park in his studies in New York of the type of bacillus causing the tuberculous infection states that from 6 to 10 per cent of cases under three years of age dying of tuberculosis, show the bovine type of bacillus.

The bovine type of tubercle bacillus is very frequently found in tuberculous peritonitis which would seem to indicate the milk as the source of infection. In these cases, we find the (1) ascitic form in which the presence of fluid in the abdominal cavity is the distinguishing feature, and (2) the so-called fibrous type in which massive glands may be easily felt.

5. **Involvement of the cervical glands** (Figs. 123-124) in which the infection enters through the tonsils and adenoids is not as frequent during infancy as it is during early childhood, though we see it frequently during the second year. An inflammation is set up in these glands similar in character to tuberculous lesions wherever they occur. If allowed to run its course, the inflammatory process goes slowly through the stages of cellular infiltration and caseation (softening).

The clinical course of the inflammation in the cervical glands is easily observed. There is swelling which increases over a relatively long period; there is some tenderness; finally softening of the mass, eventually involving the skin of the neck through which the caseous contents are discharged. Such a tuberculous sinus tends to continue to discharge often over a period of months or even years. If the resistance of the patient is sufficient, the process may be arrested in any stage and remain latent or become clinically cured. A latent focus in the glands, or elsewhere may have its activity renewed by some other illness or any other factor which greatly lowers the resisting power of the individual. From the standpoint of disability and mortality, this is probably the most hopeful type of tuberculous disease met with in infancy because it may be checked or kept localized or the glands may be completely removed, though this is not always indicated.

6. **Bronchial Gland Tuberculosis.** The diagnosis of tuberculous disease in childhood is often very difficult to make where the symptoms are not localized.

The primary stage of a tuberculous infection is now conceded to affect mainly the glandular system, spreading as a secondary manifestation to neighboring tissues or organs. The primary and secondary involvements may have a fairly close time relationship, whereas it is more common to find the third stage appearing, if it appears at all, very much later.

The typical picture is a primary involvement of some one of the most important glandular chains. Thus a tonsillar infection leads to involvement of the cervical lymph chains. A primary bronchial gland involvement spreads through the different chains of glands surrounding the bronchi. Peritoneal glandular involvement follows the same general course, involving the peritoneum.

FIG. 123.—Tuberculous cervical adenitis.

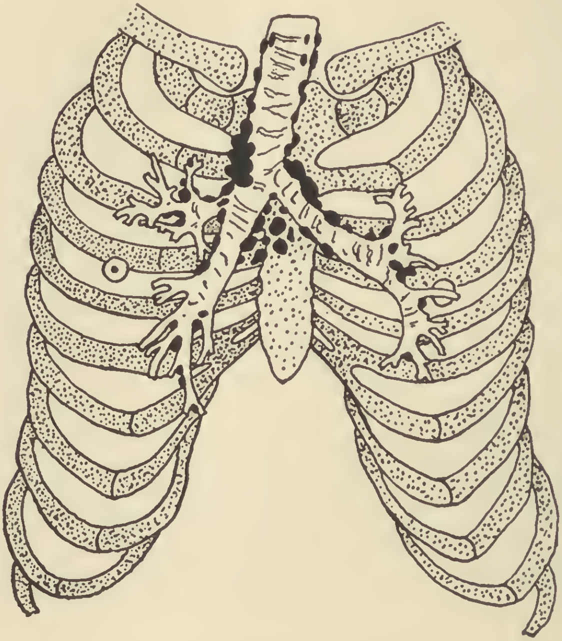
FIG. 124.—Tuberculous cervical adenitis.

Secondary involvement from these chains is usually of the surrounding tissues. The glands themselves may not necessarily go on to caseation to infect the surrounding structures. It depends more on the number and rapidity of growth of the tubercle bacilli and their egress to the surrounding tissue. If the glands do go on to rapid caseation, we are more apt to have a disseminated acute tuberculous infection.

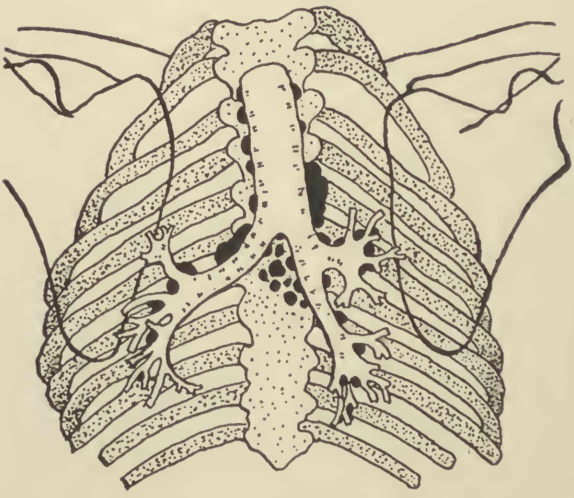
Diagrams I and II show the anatomical relations of the glands anteriorly and posteriorly. It is seen how much variation in physical signs could result from the enlargement of the various groups. There are three main sets of bronchial glands: first, the glands that accompany the bronchi and trachea. The second group lie at the angle of the division of the small bronchi. These lie within the lungs. The third group, the hilus glands, are made up of the glands to the right and left of the tracheobronchial angle and of the glands in this neighborhood. This group probably plays the most important role in the primary infection of bronchial tuberculosis in children.

From the location of these three sets of glands and from the fact that they are never involved in the same way in two different children and because of the position of the heart and the great vessels and thymus, it is not to be wondered at that our physical findings are often confusing, and that with glands undoubtedly present, we often get no physical findings. It becomes important, therefore, in the consideration of any case to study the history of exposure.

The importance of the history of exposure is especially true in children under five, as it is during these first years that we see most of the cases of acute tuberculosis. In the chronic glandular type which we are discussing, it is often not easy to determine the source of infection. It has, however, been clearly shown that gland involvement is almost always present in children where one or more of the family are tuberculous, even though there are no clinical manifestations. Clinical manifestations are also usually very indefinite. They are usually only definite in the acute types. The personal history of these subacute and chronic cases is significant in its indefiniteness. Among the earlier symptoms which I have come to place reliance on are changes in the nervous system, increased irritability, change in disposition, fits of moderate temper or crying for no obvious or sufficient cause; they tire easily; are apt to be tired in the mornings even more than in the afternoons; they show an indefinite languor which is sooner or later followed by loss of appetite, which may be very capricious. They evidence stronger likes or dislikes than usual. They may or may not have slight attacks



No. I.



No. II.

Diagrams I and II show the anatomical relations of the glands anteriorly and posteriorly. It is seen how much variation in physical signs could result from the enlargement of the various groups.

of indigestion. Very uniform is the lack or loss of tissue turgor. Their muscles are flabby and though they may not show marked loss in weight, their weight curve is usually quite fluctuating with the trend downward. Pallor is a general finding, though this is usually associated with rapid vasomotor changes, shown by rapid flushing and paling of the cheeks; tendency to cold hands and feet, which in a short time may be quite warm. Sweating around the head may or may not be present. Sweating under the armpits is not infrequently found during the examinations. They complain often of indefinite pains. These may be located in the abdomen or in the interscapular region. Their temperature chart is often very irregular; tends as often to be subnormal as it does to be above normal. The rise in temperature is often in the morning, coincident with the time when they show the greatest fatigue, and will be down in the afternoon, when apparently from the stimulation of exercise their temperature equilibrium is also better regulated. There may or may not be a previous history of infectious diseases.

Repeated physical examinations of the chest usually give certain definite persisting signs (Fig. 125). Over the area of the bronchial glands, as we have said, there is a definite resistance, and paravertebrae dullness is definite. D'Espine's sign in children old enough to whisper is present as far down as the eighth or ninth dorsal vertebrae instead of the normal at or just below the fourth dorsal vertebrae.

Often there are definite areas, either at the apex or base on one or both sides, where there are persistent slight changes, and the presence of fine rales over a limited area found on repeated examinations is very suggestive. Increased vocal and tactile fremitus in the neighborhood of the enlarged glands is common. Enlarged thoracic veins from pressure by these enlarged glands are not as frequent a finding as one would expect.

The X-ray findings in such cases are always most helpful and illuminating. The extent of the process as shown by the X-ray is usually more extensive than that brought out by the physical examination, and in the presence of a strongly positive tuberculin test it is safe in this large group of indefinitely diseased children to make a positive diagnosis of tuberculous disease. The sputum is rarely obtainable in young children, but in older children, by taking throat swabs, these very often will bring up a thick mucus secretion in which the tubercle bacilli may be demonstrated when there is no sputum at all.

7. Chronic ulcerative tuberculosis of the lungs (phthisis) is the type more common than any other in adult life. This form is rare in infancy and childhood in this country at present.

FIG. 125.—Outline of tracheo bronchial glands area = absolute dullness—unshaded area extent of peribronchial thickening.

England, France, Italy, Austria and other continental countries have always shown many more such cases among infants than the United States has recorded. During and since the war, owing to terrible hygienic conditions, chronic malnutrition and exposure, the numbers have grown rapidly and to-day such clinics as von Pirquet's, for example, which was before the war the great feeding clinic of the continent, has become a clinic for children suffering from this adult type of tuberculosis, and the picture is a tragic one (Fig. 126). Our normal statistics in this country showed this type not infrequent in late childhood. When this type does occur among children, the cough and dyspnœa

Fig. 126.—Showing active tuberculous process in right upper lobe with cavity formation.

are less prominent than in adults and hemoptysis and involvement of the larynx are rare.

8. **Tuberculous Disease of the Bones and Joints.** If the disease manifests itself during infancy in the bony system, the prognosis is very much better because it is often possible to check the condition. Tuberculosis lesions occur in the spine or vertebrae, the hip and knee joints very largely, and rarely begin before the end of the second year. The tuberculosis joint diseases in childhood are usually found as secondary to tuberculous disease of the bones. In the hip-joint disease, the head of the femur is usually involved. But all these bone and joint lesions

are developed from some latent focus of tuberculosis somewhere else in the body. The condition extends over many years, settling down into chronic conditions and deformities. Potts disease, which is the tuberculous inflammation in the bodies of the vertebrae, usually in the dorsal region, is a condition in which orthopedic surgery has made recovery possible without permanent deformity in many, many cases. In any of these osseous lesions, death may come from a sudden spread of the infection to other parts. The secondary lesions may spread to liver, spleen and kidney or brain, and may quickly prove fatal.

9. Causative Factors. Certain diseases are most important both in infancy and childhood as being predisposing causes for the development of tuberculous disease. We consider whooping cough and measles as definite predisposing factors in tuberculous infection. This presupposes the presence of tuberculous infection either previous to whooping cough or measles, or very shortly following.

These diseases lower the resistance of the child to tuberculous disease. The danger from these infectious diseases, and others that involve the respiratory tract, or for that matter any prolonged infection that lowers the resistance of the child, is that it becomes possible for the tuberculous infection to develop into tuberculous disease. This is the main reason why the recognition of infection is so important and why the prevention of any infectious diseases becomes more important in infants and children who have tuberculous infections.

10. Treatment. The treatment of tuberculosis in infants and children necessarily varies with age, with the extent and severity of the infection, and with the localization of the disease. If it is general, as it usually is in early infancy, very little can be done by treatment.

The main reduction in mortality during infancy must depend upon the prevention of infection, not on the hope of bringing about a cure, because the resistance to tuberculosis in infancy is very low and hard to develop. The older a child gets, the more hopeful is treatment if the condition is recognized early. The treatment of tuberculous disease of any organ must depend on what organ is involved. Usually the disease in childhood is prolonged, being at first very insidious; even when the disease is definitely localized in the bony system, or in the kidney or glandular system, its course is a long one.

There are three important points to be observed in treatment: first, the conservation of the child's energy. This means that the child must be kept quiet and must not be allowed to become fatigued, which is often one of the most prominent symptoms

of the disease and is shown by the resulting irritability of the child. It is often striking to notice how the appetite and general resistance of a child will improve with a definite daily regimen which conserves to the utmost the child's energies and prevents over-exertion or excessive stimulation. One might say that the factor of rest cannot be over-emphasized.

The second important consideration is *diet*. This should be one which the child can easily digest. It is wise to remember that forcing food, especially food rich in fat, may cause definite intestinal indigestion, because the digestion of fats is definitely diminished in tuberculosis, especially tuberculosis of the intestinal tract. Often where the child has had no appetite, the regimen of rest in a quiet, happy atmosphere, free from all excitement, will improve the appetite. Tonics may be used to stimulate the appetite, but the digestive capacity of the child should at the same time be carefully watched in order that no derangement may be caused.

Third, a most important point in the treatment is the use of fresh air and sunshine. The child should be out of doors as much as possible while awake as well as when at rest. The value of sun baths has been clearly demonstrated and I would like to briefly describe the most noted place in which "sun treatment" is being used successfully to-day (Fig. 127).

In February, 1918, during the war, I visited Rollier's Sanatorium at Leysin, and to my surprise found his institution crowded with children and some French and English soldiers, altogether some 2,000 cases. The hillsides were dotted with various hotels for the treatment of different types of cases. The children came from all over the world—Russia, Germany, America, France, Italy, Switzerland, etc.—and the majority were suffering from bone tuberculosis. These cases were being treated by the direct rays of the sun and practically without surgery and without casts. Upon arrival the patients are gradually accustomed to the direct rays of the sun. Rollier's method is to begin by exposing the feet of the patient first, and by slow ascending exposure of legs, thighs, abdomen, chest, back, etc., to reach the sun bath for the entire body for over an hour at a time by the end of the first month. The body becomes pigmented in varying degrees, shading from a light brown to a rich mahogany color. As the patients become accustomed to the sun, they spend the entire day out of doors, with loin cloths and sun hats and sandals as their only covering. The children have their lessons, their rest periods, their games, all out of doors, and when our party was there it was a cold winter day with winter snow crust covering the hills, and we were cold in spite

of our fur coats and heavy clothing. But the children, playing and working in the sun with just loin cloths and sandals, were glowing with warmth. Those lying out on their beds were even moist with perspiration. The war-time picture was there, in the many French and English soldiers suffering from bone tuberculosis.

The great impression made upon me was the fine, healthy condition of the children. Their faces were bright, animated, filled with life and spirit and not the usual passivity of the institution case. Their color and the tone of their muscles I

Fig. 127.—Sun-Baths.

shall never forget; they were so normal and healthy and their muscles were hard and beautifully rounded out. The affected areas were usually in a healthy condition, even where there were discharging sinuses. This impression of the splendid general tone of the children only confirmed my own previous personal experience with the sun treatment in California. The length of stay at Rollier's sanatoria averages a year and a half.

Rollier told me that very few had major operations during their stay at Leysin and there were few relapses after leaving the sanatoria as cured. A point Rollier makes, and one which my own experience confirms, is that every child must be treated as an individual; that there are few routine rules. Every child

has a careful regimen worked out as to diet, sleep, recreation and study, as well as the amount of direct sun exposure. Rollier's success is undoubtedly due to this careful individualistic attention.

In France, during the war, Dr. Paul Armand-Delille, Medicin-Chef of Rapatriés, carried on a sun school in connection with the American Red Cross work, at Mounetier, in the mountains near Evian. These children came from repatriated families, some members of which had developed tuberculosis. The children were first accustomed to the sun's rays and to the elevation. After that, they were allowed to go to outdoor school in loin cloths, sandals and hats. I visited the sunny hillside one cold spring afternoon and the children with their teacher, sitting at their portable desks, which had been carried into the open field opposite the buildings, were hard at work for a time. Then would come a period of play and gymnastic exercises. They were in the sunshine from 8 a.m. to 4 or 5 p.m. These children showed the same pigmented skin, the same firm, hard tissues. Their general appearance was that of exuberant life and health. This school was not for a cure of any disease, but was to prevent disease by building up resistance. It was the modern preventorium which is being agitated so extensively and developed in many places throughout this country for children from tuberculous families.

In connection with Madame Gillett Motte of Lyons and Dr. Armand-Delille, we organized a preventorium where the sun treatment was carried out at Sylvabelle, on the Mediterranean. The children there were largely from the occupied area of the north of France who were repatriated through Evian before the armistice and directly from the north after the armistice. The cases were mostly those of malnutrition, due to the poor food and hygiene these children had been forced to endure for three or four years. These children from the north showed great retardation in growth and development, children of ten and twelve looking like children of seven and nine. After from three to six months at Sylvabelle, they would entirely recapture their normal development and growth. In countless cases, the changes wrought were almost unbelievable; under their pigmented skin the connective tissue had not only recovered its elasticity and tone, but the limbs had acquired a most astonishing muscular development. Their entire bodies had beautiful, symmetrical modelings, in sharp contrast to the wasted flabbiness shown when their sun treatment began.

All these foreign experiences and study of these different experiments have confirmed me in my valuation of the sun treat-

ment for the children of our own country. Since coming out to California, eight years ago, I have consistently used heliotherapy as a definite part of treatment for a large number of children with various conditions. Feeling that the sun treatment is simply a part of a definite regimen in the treatment of various conditions, and that its main effect is that of a general tonic, I have used it for that effect wherever needed. In the type of cases I shall describe, I have found it of great assistance. The sun treatment alone cannot create the effect desired. The use of the sun becomes one of the factors in a course of treatment that includes diet, exercise; play, rest, and sleep, and all these factors must be worked out separately for the individual child. I have found the greatest success in cases where every detail of the regimen has been carried out faithfully.

The application of the sun treatment rests, first, upon the well-established point emphasized by Rollier, "that heliotherapy has just so much the greater efficacy the greater surface of integument exposed and the more prolonged the duration of the exposure." For this reason, much better results are obtained from general rather than the local exposure of one part of the body. The second point emphasized is the progressive exposure in order to accustom the child to the sun rays and to avoid the danger of burning, which, in certain children, such as blonde and red-haired children, is easily produced by too long exposure to the sun at the beginning. In giving any program for the sun treatment, the constant individual variations must always be remembered and allowances made for them. The effects of the sun's rays cover a wide range of individual idiosyncrasies. Some children respond quickly, others slowly. Some have rise of temperature, others may have increased pulse rate, others may become excessively irritable under the treatment. It is a common characteristic that brunettes pigment more quickly than blondes and that red-haired children pigment more slowly than any other type. A certain index to the rapidity with which the sun treatment may be extended is gained through pigmentation. The prognosis is usually better for children who pigment well, and this may be entirely apart from the question of the rapidity with which pigmentation takes place.

The program consists in successively exposing to the sun all the different parts of the body:

The first day, the exposure should consist of from one to three periods, with at least hour intervals, of from three to five minutes each on the feet.

The second day, the exposure consists of one to three periods,

with hour intervals, of five to ten minutes on the feet and three to five minutes on the legs.

The third day, the exposure consists of from one to three periods, at hour intervals, of ten to fifteen minutes to the feet and five to ten minutes to legs, and three to five minutes to the thighs.

The fourth day, the total exposure consists of from one to three periods, of at least hour intervals, of from fifteen to twenty minutes to the feet, ten to fifteen minutes to the legs, five to ten to the thighs, and three to five to the abdomen.

The fifth day, the total exposure consists of from one to three periods, of at least hour intervals, of from twenty to twenty-five minutes on the feet, fifteen to twenty on the legs, ten to fifteen on the thighs, five to ten on the abdomen, three to five on the forearms.

The sixth day, the total exposure consists of from one to three periods, of at least hour intervals, of one-half hour to the feet, twenty minutes to the legs, fifteen to the thighs, fifteen to the abdomen, five to ten to the forearms, and begin a three- to five-minute exposure to the back.

The seventh day, increase the sixth day's exposure by five minutes to each part, same number of periods at same interval, and begin a three- to five-minute exposure to the chest, the total exposure being thirty-five minutes. If there is any cardiac disturbances, protect the region of the heart.

The eighth day, the total exposure consists of three periods at intervals of three-fourths of an hour, exposing the back fifteen minutes, chest from five to ten minutes, and beginning a three- to five-minute exposure of neck.

From ninth to twelfth day, the total exposure consists of the same periods at same intervals, with one-half hour exposure of trunk.

From twelfth day to fifteenth day, the total exposure consists of the progressively increasing periods of one hour duration. The intervening periods between exposures should decrease until the child can stay exposed most of the clear, sunny part of the day.

From the fifteenth to the twentieth day, the total exposure consists of same periods of one hour and a quarter each, with three-quarters of an hour for the trunk.

From the twentieth to the thirtieth day, the total exposure consists of same periods of one hour and a half each, with one hour for the trunk. Short exposures for the head can now be begun. Children vary a great deal as to the amount of direct sun they can endure on their heads at one time.

According to this program, by the end of the first month the

patient can remain in the sun from three to five hours a day. By the end of the third month, he can remain from five to eight hours, both summer and winter, without the exposure producing the slightest malaise. After the children have become accustomed to the sun and have become pigmented, they do not have to lie in one position but can carry on their play, the nurse or mother having them change their position so that all parts of the body receive their proportionate share of the direct rays of the sun. My own experience with sun treatment, as part of an entire regimen, includes the following types of cases: Infants, with chronic intestinal indigestion, have had more rapid recovery from the inclusion of the sun treatment along with proper diet; infants and children with subacute or chronic tracheobronchial adenitis, some with positive von Pirquets, and some with negative, react well to sun treatment. Some of these cases come from tuberculous homes, others follow acute respiratory infections which have left persistent bronchial glands. These children are markedly undernourished. These are the cases that are often considered tuberculous; whether they are or not is difficult of positive determination. They at least furnish the best possible soil in which the tubercle bacillus may become active. Therefore their treatment, whether from a curative or preventive standpoint, is most vital to the individual, and important to the family. These cases are often complicated with cervical adenitis of varying degrees, or with general adenopathy. The sun treatment is very effective in the cases with superficial glandular involvement. Cases of tuberculous peritonitis, in which there is not an excessive amount of fluid, do well with sun treatment alone, without operation. Where there is an excessive amount of fluid, my experience has been that it is better to operate first and carry on the sun treatment after the distention has been relieved.

As an adjuvant to the rest treatment in cardiac cases, I have found that the sun treatment increases the tone of the muscular system, if used with care. In cases of simple malnutrition and undernourishment and rickets, I believe sun treatment has a place in the regimen.

As a part of preventorium treatment for children with tuberculous infection, it has a very definite place. I have had no experience of its use in orthopedic or surgical cases nor in cases of pulmonary tuberculosis.

For the convenience of the nurse, this exposure schedule is given in table form.

In many parts of the country and in many cities it is impossible to carry on the sun treatment successfully. The effect of

REGIME FOR SUN TREATMENT

Periods of Exposure—Twice Daily

Surface to be Exposed	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	8th day	9th–12th day	13th–15th day	16th–20th day	21st–30th day
Feet..........	3–5 min.	5–10 min.	10–15 min.	15–20 min.	20–25 min.	30 min.	35 min.	40 min.	50–60 min.	60 min.	75 min.	90 min.
Legs..........	....	3–5 min.	5–10 min.	10–15 min.	15–20 min.	20–25 min.	30 min.	35 min.	40–60 min.	60 min.	75 min.	90 min.
Thighs........	....	....	3–5 min.	5–10 min.	10–15 min.	15 min.	20 min.	25 min.	30–45 min.	45–60 min.	60 min.	75 min.
Abdomen.......	....	....	....	3–5 min.	5–10 min.	15 min.	20 min.	25 min.	25–40 min.	40–50 min.	50–60 min.	60–75 min.
Forearms......	....	....	....	....	3–5 min.	5–10 min.	15 min.	20 min.	20–35 min.	35–45 min.	45–60 min.	60–75 min.
Back..........	....	....	....	....	....	3–5 min.	10 min.	15 min.	15–30 min.	30–40 min.	40–50 min.	60 min.
Chest*........	....	....	....	....	....	....	3–5 min.	5–10 min.	15–30 min.	35–50 min.	50–65 min.	65–75 min.
Neck..........	....	....	....	....	....	....	....	3–5 min.	5–20 min.	20–35 min.	35–55 min.	55–75 min.
Trunk.........	....	....	....	....	....	....	....	....	30 min.	40 min.	50 min.	60 min.
Head..........	....	....	....	....	....	....	....	....	....	....	3–5 min.	5–15 min.
Whole body...	3–5 min.	5–10 min.	10–15 min.	15–20 min.	20–25 min.	30 min.	35 min.	40 min.	40–50 min.	50–60 min.	60–75 min.	75–90 min.

* If there is any cardiac disturbance protect the heart.

the sun rays and the tanning of the skin may be obtained by using the quartz lamp or the carbon arc lamp; there are a number of different kinds. The treatment with these lamps must be watched carefully to avoid the burning that is more quickly obtained from any artificial light. The lamp treatment,

Fig. 128.—Tuberculous conjunctivitis and retinitis: Corneal opacity shows clearly—also the photophobia in the tightly closed left eye.

of course, must be done indoors and the child loses the big factors of fresh air and stimulating breezes, and the increased feeling of well-being that the out-of-door sun treatment gives.

Tuberculin treatment is of some value both in glandular and bony tuberculosis in children. It is, of course, of no value in generalized tuberculosis in infants, and it is only of value where

it is very carefully and intelligently administered. There can be no rules laid down as to its administration; each case must be considered separately. Certainly it should not be given in such dosage as to cause marked reactions. That amount should be given which simply stimulates production of immunity, but does not cause any marked constitutional reactions (Figs. 128–129).

Fig. 129.—Shows strongly positive tuberculin reactions. Vesiculation followed by superficial ulceration.

Chart of Symptoms Complex of Tuberculosis in Children

History.

Exposure in home.
Exposure to infected milk.

Previous Illness.

Adenitis.
Tonsils and adenoids.
Bronchitis.
Whooping cough.
Measles.
Pott's disease, etc.

Symptoms.

Loss of weight or failure to gain consistently.
No appetite, listlessness.
Cough, night sweats.

Examination.

Irregular temperature, 99 and upwards.
Constantly elevated pulse, 100 and upwards.
Pallor.
Lungs—Signs at apex or base of enlarged glands.
Increased vocal or tactile fremitus.
Or Broncho-vesicular breathing.
Limited expansion.
Persistence of fine rales over limited area for several months.
As { D'Espines sign.
Vertebral dullness and resistance.
Enlarged thoracic veins.
Paravertebral dullness.
Positive X-ray examination.
Positive tuberculin test.
Positive sputum (only in advanced cases).

(In the above outline, chronic endocarditis and glandular enlargement after measles and pertussis should be excluded unless persisting for several months.)

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CHAPTER X

SYPHILIS

1. Social and Economic Aspect of Syphilis. Syphilis is an infectious disease of a chronic course with acute or subacute manifestations but in its significance it is also a serious social problem and no discussion of syphilis is constructively worth while that fails to interpret the technical findings of the disease in terms of its widespread social aspect. No individual is immune, and the individual case of syphilis is never an isolated problem but always has a beginning with some other individual, and the problem in handling the case is not only to cure it. but to prevent the disease from spreading to another individual.

Jeans gives the significance of the social aspect of syphilis briefly but convincingly when from data compiled from a large mass of statistics he states from 10 to 20 per cent of adult males are syphilitic; that about 10 per cent of married women are syphilitic; and that a minimum of 10 per cent of marriages involves a syphilitic individual. The economic waste involved in syphilis is little appreciated because quite naturally the stigma attached to the presence of syphilis in an individual has prevented this disease from being made reportable, and our statistics are based largely upon hospital and clinic figures where the disease has been discovered through diagnosis and treatment of clinical symptoms. Deaths from syphilis are for the same reason reported under another name. Osler said that "of the killing diseases, syphilis comes the third or fourth" and we also know that 75 per cent of all the deaths from syphilis occur in infants and children under five years of age. The great world war has undoubtedly caused the spread of syphilis in the general population of all countries and as a result the wastage of potential life will be even greater than any present statistics show. Jeans gives the economic wastage in conservative but vivid figures when he says that in a syphilitic family 75 per cent of all the offspring are infected; that 30 per cent of the pregnancies terminate in death at or before term which is a waste three times greater than is found in non-syphilitic families; that 30 per cent of all living births in a syphilitic family die in infancy as compared to a normal rate of 15 per cent in

the same class; that probably 25 to 30 per cent of clinically syphilitic infants die as a result of syphilis; that only 17 per cent of all pregnancies in syphilitic families result in living non-syphilitic children who survive the period of infancy; and that about 5 per cent of our infant population is syphilitic (Fig. 130).

Williams of Johns Hopkins found that of 10,000 pregnancies there resulted 705 still-births and of these 183 were due to syphilis.

Engler and Reimer report that children showing symptoms of syphilis in the first four weeks of life nearly all die; of those showing them in second month, two-thirds die, and in the third month, one-half die; only about 28 per cent of children born syphilitic survive the first year.

Even this brief discussion of the wastage of life from syphilis would be depressing indeed if we were still working with a disease whose origin was unknown and for which there was no specific treatment. But such is not the case. Syphilis is an almost wholly preventable disease and the future control and final extermination of it depends largely upon educating the public to a realization of its widespread social and economic aspect.

2. **Etiology.** Syphilis is caused by a spirillum known as the spirocheta pallida and it is subject to the same rules for transmission as is diphtheria or other diseases infectious by contact. These organisms are unable to withstand drying and are easily killed by mild antiseptics. Dry surfaces such as door-knobs, or toilet seats do not long harbor the virus and thorough washing of contaminated linen renders it safe. The disease is transmitted only by intimate contact between moist surfaces. The normal, dry, healthy, intact skin is not attacked. Sometimes a microscopic break in the skin of which one may be entirely unaware may become infected. These are the reasons why syphilis is very seldom *acquired* in childhood. It is, of course, possible for a child to acquire the disease but only by the most flagrant neglect of ordinary decencies in family hygiene.

Hereditary or congenital syphilis, affecting from 3 to 5 per cent of children has its onset before birth in the intrauterine life of the fœtus, and means that both father and mother have suffered from active syphilis. After years of study and differing opinions as to whether the syphilitic baby was the result of only a syphilitic father, and that the mother merely passively transmitted, so to speak, the germ cell of the disease from father to child, the present evidence all points to the conclusion that in hereditary syphilis, the mother is always infected and that true germinal infection does not take place. The mother may not

show any signs of syphilis or give any immediate history of having had a primary infection, and yet the knowledge of to-day all points to the presence of infection in the mother, and the fact that it may be present but latent is the basis for this conclusion. With very few easily explained exceptions, all mothers of syphilitic children give a positive Wassermann reaction with their serum. Most syphilitic mothers give a history of miscarriages which have been repeated, and this is a most important point in taking the history, as a syphilitic mother usually reports two or three miscarriages, then a still-born child followed by a syphilitic child.

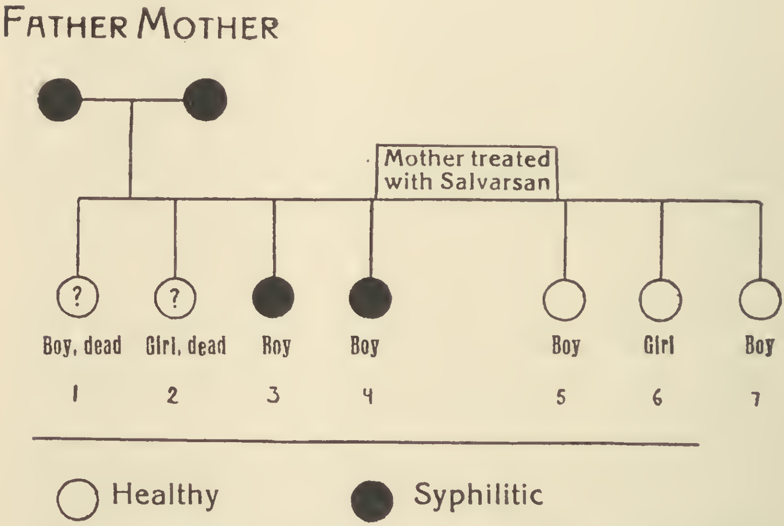

FIG. 130.—Diagram showing the effect of treatment of a syphilitic mother during pregnancy by injection of Salvarsan and Mercury internally on that and the subsequent pregnancies. (From reprint of League of Red Cross Societies on Congenital Syphilis, issued by General Medical Department, Child-Welfare Department, March, 1920.)

3. Clinical Manifestations of Hereditary Syphilis. The presence of hereditary syphilis may manifest itself at various times. The fetal cases are those showing signs of syphilis in the uterus which results in still-born children and living children. The infants that are born alive with such manifestations have a very high mortality rate. If the infection of the fetus takes place early in pregnancy, the chances for abortions and early death are greater than when the infection occurs late in pregnancy. When the infection occurs late in pregnancy, it probably accounts for those cases which have no clinical manifestation of the disease until after birth, the majority of them occur-

ring in the first month, or later in the second or third month. There are also cases which show no sign until after the first year of life, and then often show lesions when there has been no earlier sign of lesions in infancy.

Syphilis acquired during birth or just after by direct contact with a syphilitic person in an infective stage is, from the very nature of the case, a rare occurrence. If it does happen the manifestations of the disease are very definite. The primary sore or "chancre" will appear on the mucous membranes or skin and through it are spread the spirochetes to all parts of the body. The secondary lesions appear from six weeks to several months later and will remain evident or "florid" for a few days or for several months and then gradually disappear. A month or years later the tertiary lesions or symptoms appear. In *congenital* or *hereditary syphilis* the primary sore occurs *in utero* as the infection travels through the placenta. The earliest manifestations then of congenital syphilis are the secondary lesions and these are spoken of as the "early" infantile symptoms, and the tertiary lesions as the "late" lesions. There are marked differences both in the appearance and severity of the symptoms and also in their effects. The Wassermann reaction is often more marked and certainly more difficult to change. These differences in the signs and symptoms may be attributed to the differences caused by growth, rapidly growing organs are more susceptible to change and react more severely than organs that have attained their full growth before becoming infected. For this reason the skin lesions are more marked and the long bones are very frequently involved—the epiphyses during the "early" stage and periostitis during the "late" stage. Changes in the permanent teeth occur which are never met in acquired syphilis. Eye changes both acute and chronic are met in the early and late stages of congenital syphilis but very seldom are seen in the acquired disease. There is practically no mortality during the second stage of acquired syphilis whereas even with treatment it is quite high in the infantile stage, and without treatment it is very high. The late nervous symptoms are more alike although they are not as frequently met. Changes in the heart and blood vessels are practically absent in congenital syphilis, although some observers have claimed that certain hemorrhages from the stomach or intestines of newborn infants were directly due to congenital syphilis but the consensus of opinion is that most syphilitic infants show no tendency to hemorrhages.

Hereditary syphilis rarely exhibits itself until between the third and eighth week of life. The characteristic snuffling caused

by pus in the nose appears by the sixth week and other lesions in the third month (Figs. 131–132).

Naturally the appearance of symptoms is governed by the severity of the infection. The *snuffles* may be caused by very severe lesions in the nose and if not immediately treated may

Fig. 131.—Acute syphilitic eruption showing marked ulcerations of both cheeks and lips.

cause a very rapid depression of the bridge of the nose and permanent disfiguring result (saddle nose). At the same time *typical snuffles* are not easily diagnosed at first as catarrhal symptoms will cause a snuffling that bears no relation to syphilis.

Skin lesions usually follow the snuffles and they are of various kinds, usually appearing before the age of six months. Brief

mention of them in the order of their frequency must suffice. A *macular reddish brown* eruption may be present on any part of the body or the entire body (Fig. 133). Deep bleeding fissures may occur in the first few weeks in the mucous surfaces of mouth or anus, radiating outward (Fig. 134), these lesions will

Fig. 132.—Same case as (131) after six weeks of intensive mercury and salvarsan treatment.

often be deep enough to leave permanent scars (rhagides). Sometimes a *profuse desquamation* of the palms and soles is very characteristic of the condition, including a drying up and losing of the nails. Splenic enlargement is a variable symptom in congenital syphilis, appearing in from 10 to 78 per cent of cases. Perhaps the most convincing of symptoms because it

FIG. 133.—Macular papular rash of early congenital syphilis.

may occur in very severe form in the first few days is the condition of *marasmus*. All the signs of wasting are present, weakness and constant crying, a general picture of "something wrong" caused by the devastating effect of widespread infecting organ-

FIG. 134.—Saddle nose and rhagides lips (scarring).

isms, and associated with this other definite syphilitic symptoms (Fig. 135). Prompt treatment usually clears up this nutritional picture. When the condition appears before there are any *syphilitic* symptoms and continues in spite of all treatment, it is

Fig. 135.—X-ray of syphilitic showing marked syphilitic periostitis of lower extremities, particularly clear in the right femur and left tibia.

a grave syphilitic condition which will result in death, because of the deep involvement of the organs of nutrition by the rapid spread of the spirochetes. The infection may be so slight that there will be no evidence of the presence of syphilis, and here the importance of the careful study of parents and previous children is seen. When the history of syphilis is known to be the infant's background syphilis must be suspected.

Dactylitis is present in 2 per cent of cases from few months to two years of age. The fingers are more often affected than the toes and usually more than one finger. There may be fusiform swelling of proximal phalanx. Differential diagnosis from tuberculosis is possible by other symptoms.

Orchitis is present in 8 per cent of males. It is pathognomonic. The testicles are hard and not tender and the condition may be easily overlooked. It usually begins about the fifth month and is commonly bilateral. The epididymis is generally not affected. This condition appears much later in tuberculosis, is rarer and the epididymis is affected.

Anemia is often profound by the end of the first year or during the second year. There is a brownish-yellow tinge to the skin. Where there is a blood picture of secondary anemia the condition is often associated with enlarged spleen.

Other symptoms are found that are not peculiar to syphilis but which are often found in connection with syphilis.

Parrot's nodes and craniotabes are not caused by syphilis but are often found in connection with syphilis and rickets, and a roughened honeycombed deposit of bone of the parietal and frontal region, and a "hot cross bun skull." Craniotabes is more usual in rickets which are associated with tetany in which laryngismus may be present. In syphilis there is absorption of the bone but not in rickets.

After these secondary symptoms, the disease will seem to drop from sight and a child will be five, six or seven years of age before any evidence of the disease will appear. When they do appear the development of them will be fairly rapid and they will be of a destructive type although the lesions may appear as before, in any part of the body. Eye lesions are most common followed by the usual involvement of the nervous system, the bones, joints, lymph glands, mucous membranes, and lastly the ears.

The involvement of the nervous system almost immediately is reflected in definite eye changes. The inflammation of the cornea (heratitis) of first one eye and then both gradually clouds the vision, light becomes unbearable, and the fine blood

vessels spreading over the cornea quickly show the evidence of syphilis. This eye condition may result in blindness for many weeks but with treatment the cornea usually clears up sufficiently to restore vision. If the inflammation involves deeply both charoid and retina permanent blindness may result. These eye conditions are characteristic of at least one-third of older syphilitic children, involving either one or both eyes.

FIG. 136.—Hutchinsonian teeth in congenital lues.

The permanent teeth of the syphilitic child are Hutchinsonian in type. (Fig. 136.) The upper central permanent incisors are unduly small, widely separated and the cutting edge is narrower than the base and has the crescentic notching. The corners of the teeth are rounded. Sometimes the lower incisors are similarly involved. The post molars are often small and domeshaped. The temporary set of teeth are vary rarely affected except by rachitis changes.

Epiphysitis. The involvement of the long bones is a very logical result of the destructive action of the spirochetes and will vary in its clinical manifestations with the severity of the infection. It may be so slight that it will not be noticed or it may have the swelling and pain of an acute rheumatism, and the child

Fig. 137.—Sabre tibia due to periostitis of the tibia.

will cease to use the affected part. The age factor will here help to eliminate both rheumatism and infantile paralysis as neither of these conditions occur under six months and cerebral paralysis is seldom confined to one part as the pseudo syphilitic paralysis is. Periostitis of the tibia indicates deep involvements and often resembles chronic osteomyelitis. (Fig. 138.)

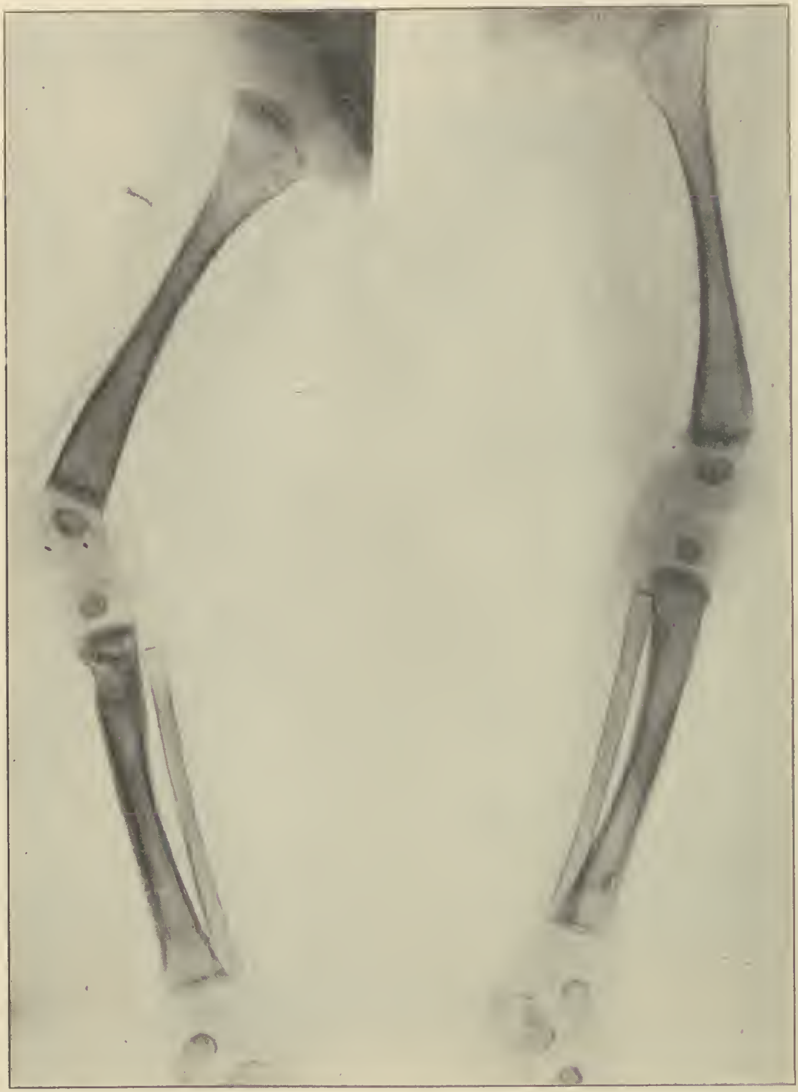

FIG. 138.—X-ray showing punched out appearance of syphilitic involvement of the bone.

Joint involvements usually affect the knees and while there may be acute pain and swelling, a gradual thickening around the joints without pain or discomfort is more usual.

Many less frequent lesions affecting the iris, the optic nerves, or the meninges are sometimes found. The mucous ulceration of the vocal chords, or just a thickening, will produce the characteristic hoarseness. Soft granulated tumors (gummatous ulcers) may appear on the skin and mucous membrane, often causing complete breakdown of normal tissue, giving the old word so often used in describing syphilis, "rotting," real significance.

The nervous symptoms of syphilitic children are usually late development of childhood and vary in severity. There may be total blindness, partial (hemiplegia) just one side or paraplegia, the paralysis of the legs and lower part of the body. Convulsions, epilepsy, marked and progressive mental degeneration, may be part of the picture of late stage of inherited syphilis. Tabes dorsalis and general paresis may be met in early adolescence. This is also the time when the ears will be affected by the inflammation, slow but steady, of the internal ear and the hearing may be lost completely in a short time after the symptom appears.

Nephritis may be present but usually without edema or any of the symptoms of acute nephritis. Enlargement of the lymphatic glands are found sometimes as a late manifestation but must not be confused with adenitis due to malnutrition. During adolescence, deafness may appear caused by an insidious inflammation of the internal ear.

Diagnosis of syphilis or lues may be made by means of the Wassermann test of the blood and spinal fluid. The family history plays a very determining part often in the diagnosis as the Wassermann reaction is seldom positive in the first few months of life, and almost never in the newborn. The clinical manifestations such as the typical skin lesions, often take precedence over the laboratory diagnosis which may have given a negative reaction at a given time because a negative Wassermann at birth may later become positive which Veeder thinks may be due to the fact that "the infection occurred just before birth and that some time must elapse before the formation of reactive bodies."

But on the whole positive Wassermann reactions in non-syphilitic patients are very rare. Veeder has found "that in all the patients with the late type, i.e., in which those lesions develop

after the first year, and over 90 per cent of the cases with the infantile type of hereditary syphilis, i.e., those cases in which the disease develops after birth and during the first year, have positive Wassermann reactions." This refers, of course, to untreated cases.

The leutin test of Noguchi does not offer any diagnostic advantage over the Wassermann reaction for hereditary syphilis which may be more or less due to the fact that most laboratory workers upon whom we rely have been trained to the Wassermann test which means careful control, most delicate skill and accuracy, a technique once mastered it is difficult to begin with other methods. But any method may be bettered or simplified without particularly changing its diagnostic value.

Treatment. In both acquired and hereditary syphilis or lues, the treatment must be active and energetic. Treatment to prevent syphilis and save life begins with the treatment of the syphilitic mother during pregnancy and as early as possible in the pregnancy. Many studies show this. William of Johns Hopkins gives the following statistics: 169 pregnant women with positive Wassermans and with no treatment during the term of pregnancy had 48.5 per cent syphilitic children; 102 patients with inefficient treatment had 39.2 per cent syphilitic children, and 179 patients with efficient treatment had 6.7 per cent syphilitic children.

Fordyce and Rosen believe that anti-luetic treatment begun early in pregnancy prevents abortions and miscarriages, and insures the birth of a healthy non-syphilitic baby and that treatment begun late in pregnancy cannot be depended upon to accomplish such results.

The usual routine of care of every prospective mother, therefore, should include an early Wassermann test and if the test is positive, immediate treatment should be begun, and then the chances for a healthy child are very good. The routine care of every child born of a mother or father with syphilis should include constant testing by Wassermann at birth, again two weeks later and as often as every four weeks, until the child is six months old. After that the test should be made every three months until the child is two years old. If all such tests are negative over that length of time and there have been no clinical manifestations, one may safely assume that the child has escaped the infection.

When diagnosis gives hereditary syphilis present, treatment must begin at once. I will give Fordyce and Rosen's chart for treatment as it has been well tested.

Infants 2–12 wks. old—	neo-arsphenamine	0.1 gm.	intramuscularly once weekly	for 6–8 wks.
Infants 3– 9 mos. old—	neo-arsphenamine;	0.15 gm.	intramuscularly once weekly	for 6–8 wks.
Infants 1– 2 yrs. old—	neo-arsphenamine	0.2 gm.	intramuscularly once weekly	for 6–8 wks.
Infants 3 yrs. old—	neo-arsphenamine	0.25–0.3 gm.	intramuscularly once weekly	for 6–8 wks.
Infants 2 wks–6 mos.	mercury chloride	gr. 1/10	intramuscularly once weekly	for 10–12 wks.
Infants 6 mos.—1 yr.	mercury chloride	gr. 1/8	intramuscularly once weekly	for 10–12 wks.
Infants 1 yr. —2 yrs.	mercury chloride	gr. 1/7	intramuscularly once weekly	for 10–12 wks.
Infants 2 yrs. –3 yrs.	mercury chloride	gr. 1/5	intramuscularly once weekly	for 10–12 wks.
Over 3 yrs.	mercury chloride	gr. 1/4	intramuscularly once weekly	for 10–12 wks.

Any such treatment, of course, must take into consideration the individual case. Some children cannot stand such medication. Nutrition may suffer too much and the very life of the child be threatened. Albumin may appear in the urine, etc. A very weak or premature baby is best given the beginning of the treatment with 6-8 injections of $Hgcl_2$ (bichloride of mercury).

Neo-arsphenamine (neo-salvarsan) is undoubtedly the best drug to use to clear up quickly an acute lesion, but for long continued treatment, mercury in some form such as the injection of bichloride of mercury, the internal administration of grey powder, or mercurial ointment rubs is still the best form of treatment. Potassium iodide (K.I.) given in increasing doses plays a part in the treatment of the chronic, tardy or latent forms.

The nurse in caring for a syphilitic baby with open lesions must take the same precautions in the care of herself as are taken for any infectious contagious disease. Care of the nurse's hands are especially important, and any slight abrasion in the skin must be protected.

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CHAPTER XI

THE NERVOUS SYSTEM

We have already discussed the anatomical growth and development of the brain and nervous system; the rapid structural growth of the child's brain the first four years of life; the tripling of the weight of the brain during this four-year span; the beginning of all the special sense and motor faculties; and the much slower development of reason and higher intelligence. The reason for the emphasis throughout our study thus far upon the development of the brain and nervous system is because successful nursing of children depends upon an intelligent understanding of the significance of this development. We have spoken of the necessity on the part of the nurse of understanding the child in order to successfully handle the case. In the disorders of the brain and nervous system, it is specially important for the nurse to possess far more than successful technique of nursing care. The way in which a nurse approaches a sick child, irritable and nervous from some acute disturbance of the nervous system, reveals at once her understanding of the more intangible but the most important aspect of such cases. In the study of convulsions, for instance, the significance of the rapid growth and development of the brain and nervous system is shown in the early and easy appearance of convulsions as a result of the instability which comes with rapid changes in structure.

Convulsions may be the easily induced symptoms of this congenital instability or of an acquired instability. If the congenital history is bad, convulsions may occur almost from the beginning and be a marked characteristic of the child's whole development. Again convulsions may never appear until some chronic condition such as rickets or some acute toxic disease may induce the attack. The first distinct group may be those we see but seldom, fortunately, the convulsions resulting from definite acute or chronic brain virilations, caused by tumors, emboli, meningeal hemorrhages and may, in some instances, as we shall see, be affected by treatment. Long-continued irritations of the cortex of the brain will result in such changes that convulsions of the usual type result, the sudden severe seizures.

Convulsions are often the result of the functional derange-

ment caused by acute infectious diseases or by such chronic conditions as tetany and rickets. In all these conditions we again see certain disadvantages in age. The young developing child with his natural nervous irritability incident to growth plus an inherited nervous instability is very apt to react *explosively* to acute infections, where an adult might merely feel stupid and feverish at the onset. Children differ also in the rapidity or slowness they show in having convulsions. Some children will have them at the slightest upset, and others only when rickets or tetany are present. When these conditions *are* present, convulsions may occur most unexpectedly and when there *are* those grave instabolic disturbances of the mineral content of the body, very simple conditions of constipation, or local irritation of teething may induce convulsions. Rickets are often the cause of certain local spasms and twitchings. The convulsive closure of the glottis will produce the well-known tonic convulsion which seems to have come on because of a deeper inspiration of breath or the sudden crying of the rickety infant. He will become fixed as though holding his breath, his features twisted, his face blue. The child may quickly recover or general convulsions may result. Sometimes the convulsive tendency in rickets will be confined to mere facial twitching.

In early life any unusual article such as decomposed food or a poisonous drug may cause sufficient functional derangement to induce convulsions. Tetany is the most common basis for infantile convulsions.

Convulsions caused by functional disturbances will depend for their cure upon the way in which the cause of the convulsions yields to treatment, and the care of the infant during the acute convulsive state.

The characteristic picture of convulsions has two phases and these are usually present together. The convulsions may be a single continued involuntary contraction of voluntary muscles such as the glottis closure, accompanied by a general rigidity of the body (tonic). This first phase usually merges into the second, that of a *series* of these first contractions and the child will jerk and twitch spasmodically (clonic).

The usual attack of convulsions from any cause begins with slight twitching of some part of the face or body, sudden stiffening of the body and rolling of the eyeballs or a rigid glassy stare of the eyes. The head is usually held backward from a stiffly arched back while the hands will be clenched with thumbs in palms and the arms bent, and the arms and legs jerking quickly, the face twitching and getting blue from the lack of air caused

by the spasmodic contraction of the muscles of respiration. The child will seem to be choking from the rattling sound in the throat and the pulse may be very weak and irregular. The child may be unconscious and the whole picture be most alarming for a few moments. Then gradually the convulsive twitching and stiffening will lessen until the body finally relaxes and consciousness slowly returns with usually in mild cases a sharp cry from the child. A convulsive seizure may have any or all of these phases and in different degrees of severity. If the convulsion has been very severe the child may lie in an exhausted stupor for some time. When the convulsion recurs again in a few minutes and the same picture is again present, the child may show extreme exhaustion. Sometimes these convulsions will occur again in a few hours or again in a few days. In spite of the severity of convulsions, children seldom die of them although the end of some acute condition may be death in convulsions. Recovery is the usual prognosis.

At the same time one must remember that repeated severe convulsions cannot have very desirable effects upon the growing organism, and a constitutionally nervous child subject at the slightest provocation to serious attacks of convulsions cannot be said to have an unhandicapped beginning, and there is little doubt that there have been later mental abnormalities which may be traced to these attacks. A very few cases of true epilepsy may be definitely related to early convulsions. Osler gave 40 per cent as the percentage of epileptics who had suffered from early convulsions.

Treatment. All immediate treatment of convulsions must be in a sense of an emergency character. Causes of the convulsion must wait for *their* diagnosis and treatment until the immediate convulsion is controlled. Nothing is more alarming or terrifying to parents than to see their child in convulsions and the average nurse must often occupy them by giving them something to do as well as look after her patient. The first thing is to stop the convulsion and the administration of an anesthetic will do this. Bromide, morphine (hypodermically) or chloral by rectum should be given. As the effects of these will be slower, a hot bath, or better a hot mustard pack because this requires less handling should be given to bring the blood to the surface. Ice bags at the head will often assist in relieving the condition. These measures may be sufficient to bring the child out of the convulsion. The child should be protected against further convulsions first determining and removing the cause, if possible, and second, by continuing the palliative sedative treatment.

These drugs are usually well tolerated. Morphine may be given in doses from 1/50 grain during the first year to 1/20 grain at three years. Chloral is irritating to the mucous membranes and at times is not retained when given by rectum. The dose varies from 4 grains at a year or under to 8 grains at two or three years. In mild cases sodium bromide may be given by mouth, or in combination with the chloral, the dose ranging from 3 to 10 grains. The effect of both morphine and chloral should be evident in about half an hour, if not, care against overdosing should be taken in repeating the dose.

When acute cyanosis is present, oxygen will relieve the cyanosis and at times stop the convulsion. In all cases washing out the stomach and colon irrigation are indicated after the convulsions have subsided whether the convulsion is due to gastro-intestinal disturbance or not. Where constipation is the cause, a cathartic of castor oil may be given.

When tetany is the underlying cause of the convulsions, an immediate attempt must be made to correct the deranged salt metabolism. This is done by the immediate withdrawal of milk, and by the subcutaneous injection of magnesium sulphate, from 15 to 60 grains in a day. The administration of calcium and cod liver oil in the feedings will in time correct the derangement in the calcium metabolism. Constipation must be avoided. Cereals and vegetable soups are well tolerated.

In all nervous and mental conditions, the eyes should be carefully examined. First the condition of the pupils, whether they are equal, whether they react equally and normally to direct light; second, the presence or absence of strabismus or squint; whether the squint is a congenital condition. whether the squint is a simple incoordination of the ocular muscles which often occurs in young infants, or whether the squint is due to a real paralytic condition which indicates central nervous trouble; third, oscillating movements of the eyeball, nystagmus, is often indicative of central nervous trouble. The movements may be from side to side, up and down or rotary. Nystagmus as a congenital defect is rather rare. Fourth, the examination of the fundus is probably one of the most important to determine central nervous trouble. *Opisthotonos* (Fig. 139) means retraction of the head with rigidity of the neck muscles and it generally indicates irritation of the central nervous system. This condition is especially significant in the diagnosis of meningitis. It may, however, be present without indicating any central nervous disturbance, as when one finds it in emaciated atrophic babies.

The superficial reflexes are often uncertain in normal infants

but they increase in importance with the age of the child because of the growing stability of the nervous system. Most of the skin reflexes such as the abdominal, cremasteric are not important during infancy and young childhood. The knee jerk in infancy and childhood is often difficult to obtain but it is always present in normal children. Central nervous irritations such as meningitis usually increase the knee jerks whereas tumors may cause entire absence of the knee jerks. Babinski's reaction, which is obtained by stroking the plantar surface (sole) of the foot, when positive (abnormal) causes an extension of the big toe, when negative (normal) causes a flexion of the big toe. In young infants this reaction may be positive, and often is, without signifying any central nervous disturbance therefore; it has little weight as a symptom until after the second year.

Fig 139.—Opisthotonos.

Ankle Clonus. This reaction is of value in older children when it is produced by a quick flexion of the foot. When positive, the foot will have a clonic tremor.

The Kernig Sign. This reaction is of great importance in determining the presence of meningeal irritation. When positive, the child lying on his back with his thighs at right angles to his trunk cannot extend his legs to a normal vertical position because of the contraction of the hamstring muscles. In acute cases, this contraction may be so great that the legs will not extend beyond an right or even an acute angle to the thighs.

Brudzinski's Neck Sign. That is often spoken of as simply the neck sign. It is positive or present when with the child lying on its back, the head is quickly flexed on the chest so that the chin touches the chest, the thigh and leg will be drawn up on the abdomen. This does not occur in the normal child.

In all nervous conditions, the presence or absence of paralysis must be noted. These observations must determine whether they are true or pseudo-paralysis. Pseudo-paralysis may be due to

FIG. 140.—Position for holding child for lumbar puncture.

pain as in scurvy, or to muscular weakness as in rickets. The gait of the child is important. In infants, unsteadiness of gait is normal but in older children it is a very suggestive symptom

FIG. 141.—Needle for lumbar puncture.

of cerebellar difficulty (because the coordinating centers, the equilibrium are located in the cerebellum and mid-brain).

In certain conditions, changes in the electrical reactions are

important in making a diagnosis and in very many cases, the study of the spinal fluid by lumbar puncture is of utmost importance not only in the diagnosis but also in determining the treatment. (Figs. 140, 141, 142.)

Congenital Hydrocephalus (Fig. 143). In our chapter on Anomalies and Pathological Conditions of the Newborn, we have stated the causes of this condition as due to obstruction of the flow of the spinal fluid from the ventricles to the subarachnoid space, or to hyper secretion of the spinal fluid, or to delayed absorption of the spinal fluid. Whatever the cause the child

FIG. 142.—Method of injecting serum into spinal canal.

presents a characteristic picture; first, enlargement of the head, the rapidity with which the head enlarger, varies with the completeness of the cause, i.e., if the obstruction is only partial, the enlargement of the head is very slow. If the obstruction is complete, the growth is very rapid. This enlargement of the head varies also with the age of the child. If the fontanelles and sutures are closed when the hydrocephalus begins, the bulging and separation of the sutures will not be as marked, but the pressure symptoms will be increased the later the condition develops. The brain tissue itself is compressed and gradually destroyed and this may cause all the pressure symptoms of convulsions or epilepsy. As the upper part of the head (cranium)

enlarges, the face becomes relatively smaller and more wizened, the eyes protrude and the forehead bulges. (Fig. 144.)

Diagnosis. The methods used for diagnosis of the type of hydrocephalus depend upon the injection of certain dyes or air into the ventricle, i.e., if dye is injected into the ventricles and a

Fig. 143.—Congenital hydrocephalus.

lumbar puncture done in three to five minutes, and there is no dye found in the spinal fluid, an obstruction is present. If the dye is present in the spinal fluid but is not secreted through the kidneys, i.e., does not appear in the urine in 60 per cent quantity in two hours, there must be some delay in absorption.

If air is injected into the ventricle, an X-ray of the skull will show the point where the obstruction is located. This method of diagnosis is receiving more attention, and offers better possibilities for the exact location of the obstruction in the brain. There is no very successful test for the hypersecretive type.

The treatment depends upon the cause. If the condition is due to an obstruction such as a tumor, or cyst or an inflammatory process, the obstruction must be removed by operation, or a new channel or exit must be made for the spinal fluid from the ventricles by puncture of the corpus callosum. Treatment of the absorption type is very unsatisfactory. In the hypersecretion type, it may be affected either by giving thyroid, or

FIG. 144.—Congenital hydrocephalus showing dilated veins.

operating on the choroid plexus but neither of these methods are very successful.

Prognosis. Many of these cases die. Many of the cases that live are mentally affected if there is any extensive destruction of the brain tissue. A very small percentage retain their brain faculties.

Brain Tumors (Fig. 145). Brain or intercranial tumors during infancy and childhood produce fairly constant symptoms. Vomiting is often of the projectile type and no immediate cause of the vomiting can be found in the child's condition. The next symptom is optic neuritis. This, of course, can only be absolutely determined by examination of the eye ground but may often be rather fairly suggested by the change in the child's keeness of vision, or nystagmus and strabismus may be present. Signs of increasing internal pressure are shown also by dizziness

or the appearance of general convulsions which may be the first symptom of a cerebral tumor. The convulsions may be frequent or infrequent. If the child is old enough, headache is usually a fairly constant symptom. Paralysis of special groups of muscles,

FIG. 145.—Characteristic wide spread legs in Ataxia due to brain tumor.

or changes in sensation in special groups of muscles or changes in equilibrium or changes in reflexes aid in localizing the tumor. The symptoms, however, may be so general that localizing of the tumor is impossible.

Etiology. Most brain tumors are tuberculous in origin but

gliomas or gliosarcomas are not uncommon though any form of malignant tumor may be found. The prognosis of all intercranial tumors is relatively poor.

The only specific treatment is the removal of the tumor where that is possible. When the tumor cannot be removed, relief from pain and prolongation of life is gained by trephining and puncturing the ventricle to relieve pressure. In rare instances, when the tumor is a syphilitic gumma, antisyphilitic treatment will cure the condition.

Infectious Processes of the Nervous System

Meningitis is not an uncommon infection in infancy and childhood. It is caused by an inflammation of the meninges and is classified according to the bacteria causing the inflammation. The differential diagnosis is made chiefly by identifying the causative organism in the cerebrospinal fluid obtained by lumbar puncture. The three most usual types of meningitis are tuberculous, simple, acute, and epidemic. In the chapter on tuberculosis, we have discussed tuberculous meningitis as one of the three types of tuberculous infections most often found in infancy and childhood and the age incidence and extreme susceptibility in relation to the age period for tuberculous infection. Here I would like to emphasize the picture of tuberculous meningitis as met by the nurse, and stress the nervous symptoms.

Symptoms. The early stages of the disease will give the symptoms of a general tuberculosis, loss of appetite, more or less rapid loss of weight, with changes in the general circulation, irregular temperature and the other general symptoms. The first signs of meningitis will be actually sudden in appearance usually related to the general nervous symptoms of the past history. The first sign may be a convulsion, or the opposite, a lapsing into unconsciousness or semi stupor and for three or four days the cerebral symptoms may remain indefinite. The stupor may persist or the convulsions may be more frequent. The child may complain of headache or be irritably affected by bright lights or sudden noises. A certain rigidity of the neck muscles with the head drawn back is characteristic, and the extremities will also become gradually rigid. After several days of this acutely irritable condition, the symptoms slowly change. The body slowly relaxes, the low temperature of the irritation stage may begin to climb up. The drowsiness and stupor increase, the child seems paralyzed and lies quietly as a rule. The pulse becomes slow and irregular, the breathing becomes first slow and then rapid, and the child is aroused from the stupor with increasing diffi-

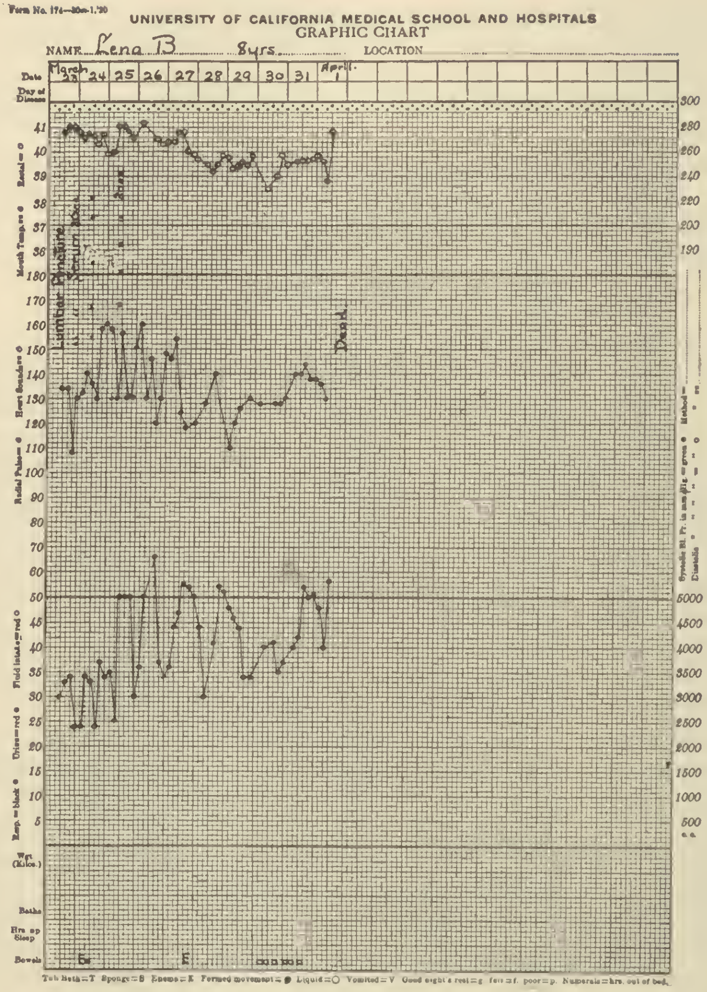

Chart 17.

Legend for

Lena B. (Hospital No. 11057)

Age: 8 years.
Diagnosis: Acute Streptococcus meningitis.

Lena B. was an Italian child who three months before admission had had an acute otitis media followed by mastoiditis for which she had been operated. She had apparently recovered and been well until three weeks before admission when she developed symptoms again of acute otitis media and had a discharge from the right ear for the last two weeks. On admission, her right ear was discharging. She had a temperature between 40°C. (104°F.) and 41°C. (105.8°F.) with marked spasticity of the neck muscles. Kernig's sign was positive, spinal puncture disclosed spinal fluid

culty. The child may at times wave its arms but as the reflexes diminish or become entirely negative the muscles entirely lose their rigidity and the body seems to collapse and the state of coma deepens. It becomes impossible to feed the child by mouth as the ability to swallow is gone. By this time, the temperature may rise sharply, the pulse increases in feebleness and rapidity, and the end will come quickly in acute convulsions or in a series of clonic movements or twitchings, or even coma. With low temperature the end comes more slowly, the child seems to die from the overwhelming exhaustion apparent in the complete relaxation of the body.

Simple acute meningitis (Chart 17) is a type of meningitis caused by one of the ordinary pyogenic organisms and is usually spoken of as streptococcus, staphylococcus, or pneumococcus meningitis according to the causative agent. The various infections have an almost identical set of symptoms and it is therefore possible to discuss them as a whole although more exact diagnosis is not based upon these clinical manifestations but the bacteriological findings.

Diagnosis. Positive diagnosis is made by examination of the spinal fluid by lumbar puncture. In simple meningitis the spinal fluid under moderate pressure is cloudy with a thick fibrin clot. Specific organism are usually quickly found.

The disease may extend over several weeks although the average duration is less than a week as the infection occurs either by way of the blood stream from local infections or by way of a general septicemia which is rapid in development. Any infection near the meninges such as an otitis media and mastoid involvement may lead to an extension of the infection to the meninges. The onset will be as a rule the same sudden one we have described with usually vomiting, high fever with stupor in convulsions and the usual fatal ending. Meningococcus meningitis has usually more marked rigidity of neck muscles.

Epidemic Meningitis (Cerebrospinal fever—Spotted fever). Epidemic meningitis like all infectious diseases has various forms, abortive, mild, severe and malignant. They are all equally capable of transmitting the disease although the ease with which the disease is transmitted varies. The meningococcus is the causative organism.

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increased in quantity and very cloudy. Examination of spinal fluid showed pus cells and streptococci. Culture also showed non-hemolytic streptococcus. She was given anti-meningococcic serum without any effect. Her temperature remained quite high. She died on the tenth day after admission.

The disease results from the entrance of the organism into the body by way of the nose and throat. This renders transmission easy as the organism may be cultured from those membranes in the early stages of the disease. Epidemics may be widespread or cases may appear sporadically here and there. It is a disease of young childhood, three-fourth of the cases occur under ten years.

The **symptoms** of the ordinary form of epidemic meningitis are typical. The onset will occur in usually less than a week after exposure, and the prodromal symptoms are usually fever, great prostration, severe pains in head, neck, back and legs, vomiting frequently followed by convulsions. Rigidity of the entire body and opisthotonos are marked. The child will scream when moved and there are times of marked delirium followed often by drowsiness or complete coma. Herpes is not an uncommon occurrence. In severe cases purpuric eruptions appear and in certain epidemics erythematous spots distributed all over the body have given it the name of spotted fever. If no treatment is given, death comes quickly in the severe cases. In milder cases the child may live several weeks and then die of inanition or of other complications. Recovery is slow, the temperature and nervous symptoms gradually disappear and the end result may be a cripple physically and mentally. Such results are fewer, since the discovery and use of specific treatment, early.

Treatment. The early use of antimeningococcic serum has reduced the high mortality of epidemic meningitis among children and the crippling results upon recovery have been reduced. Before its introduction the mortality varied from 40 to 80 per cent, now the mortality is about 20 per cent. If the serum is given within the first 12 to 48 hours of the onset, the recovery is often as by crisis. The serum is given intraspinally, into the ventricles and intravenously. The usual route is the intraspinal. About as much serum warmed to the body temperature is given by the gravity method as the amount of spinal fluid withdrawn. The other routes are used in more severe cases.

The higher mortality in infants is due to the fact that the inflammatory process is much more likely to obstruct the normal circulation of the spinal fluid and produce hydrocephalus. The serum in such cases should be introduced into the ventricles. When serum acts successfully the symptoms, fever, vomiting and rigidity disappear about as rapidly as the spinal fluid clears up, this being a good indication of the results.

When the treatment fails to give satisfactory results a

number of reasons are usually factors in the situation. The child may have an *overwhelming* infection, in which too much damage has been done before the injection of the serum. The serum used may not contain antibodies specific for the strain of meningococcus affecting the patient. Or again the meningococci may be walled off in some part of the ventricle or subarachnoid systems inaccessible to serum treatment, and finally there

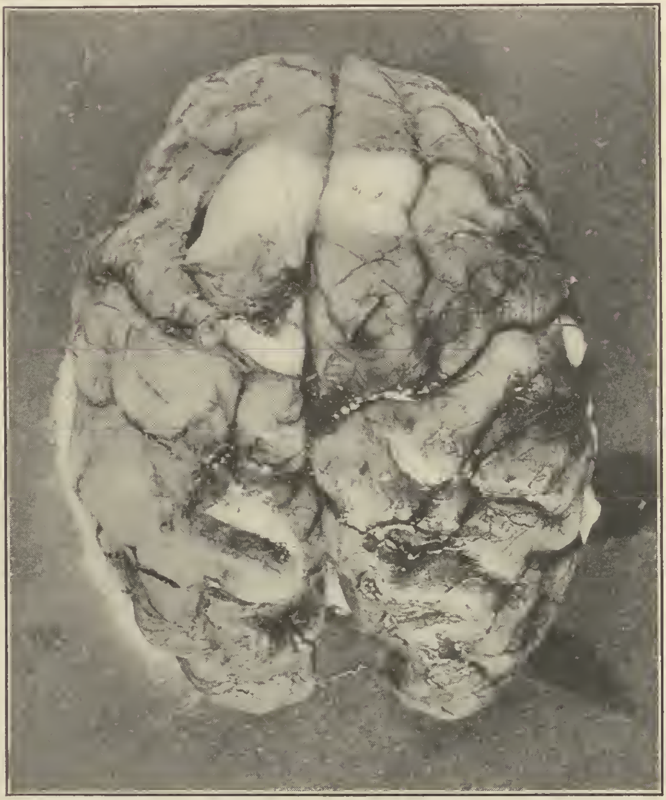

FIG. 146.—Brain showing thickening of meninges from acute meningitis.

may be other acute complications which will directly affect the outcome disastrously (Fig. 146).

Encephalitis. In infancy and childhood the involvement of the central nervous system is not always caused by these pyogenic organisms we have discussed. Toxic or irritative involvement of the central nervous system is not uncommon. During any acute infection especially such infections as pneumonia, central nervous symptoms due to toxic or irritative products may arise

At times, these manifestations resemble an acute meningitis, beginning with convulsions, rigidity of the neck and other symptoms of internal pressure. An examination of the spinal fluid in such cases will show practically no increase in cells though the fluid may be under pressure and increased in amount. At other times, the symptoms are more encephalitic or mental in type. Delirium is present, and other symptoms of mental rather than meningeal irritation exist. Such a condition is called a toxic or simple encephalitis. It must be clearly differentiated from the condition known as acute epidemic encephalitis. Acute epidemic encephalitis resembles in its pathology and epidemiology that of poliomyelitis. Both these conditions appear in widespread epidemics at fairly long intervals but are also to be found in isolated cases or in small local epidemics from time to time. Both conditions are spread by human carriers. Both these conditions are produced by a filterable virus, and culturally it has been claimed that both are due to an ultra-microscopical organism. The virus of both has a selective action on the central nervous system although they affect, more or less, all the organs of the body. In poliomyelitis, this selective action is mainly on the anterior horn cells of the spinal cord and for this reason, it is often called anterior poliomyelitis. In reality, the condition affects the whole central nervous system. In acute epidemic encephalitis, the pathological picture is more evident in the basal ganglia of the brain and for this reason, the symptoms are much more variable. The clinical picture may be one of marked lethargy, a symptom which so often predominates that the condition is spoken of as lethargic encephalitis. On the other hand, the clinical picture may have the symptoms of acute epilepsy or chorea. Paralyses or palsies are not uncommon, the most frequent one being an occular motor palsy. When this is present, it is almost a pathogomonic symptom of epidemic encephalitis. Other varieties such as polyneuritic or ataxic forms may occur, or there may be any combination of all these symptoms. In its onset, its course and its progress, encephalitis tends to be a more prolonged type of infection than poliomyelitis. Recurrences or exacerbations of symptoms are not uncommon.

The prognosis, as far as death is concerned, is not as bad as that of poliomyelitis, but the sequellae or mental changes in the wake of an epidemic are often as marked as the muscle changes following poliomyelitis. The condition of epidemic encephalitis appears more often in adults than in children which is just the opposite of epidemic poliomyelitis.

Treatment. There is no specific treatment for epidemic encephalitis, though in an epidemic the blood serum from a recently

recovered case would probably contain enough specific antibodies to protect an individual in the prodromal period. Aside from this the treatment is symptomatic. Because of the variableness in symptoms and the long duration of the disease, and the many mental changes resulting, the disease is a most difficult and discouraging one to treat and to nurse.

The epidemic character of the disease makes it a reportable disease, and careful isolation of cases should prevail during an epidemic and all the nursing procedures for contagious diseases should be strictly followed.

Poliomyelitis (Spinal infantile paralysis, epidemic poliomyelitis, anterior poliomyelitis, infantile paralysis).

Etiology. Infantile paralysis is caused by a filterable virus and an ultramicroscopical organism producing an acute inflammation of the central nervous system.

The virus is unknown apart from infected human beings. It possesses a high degree of resistance both to cold and ordinary degrees of heat for long periods. It withstands drying very well if enclosed in albuminous matter, which probably accounts for its prolonged vitality in the naso-pharyngeal tissue. It can stand both moist and dry conditions and can therefore be carried into the upper respiratory tract as a spray produced by coughing, sneezing and loud speaking, and as dust. It is evident from all the experimental work that other agents than man play a minor part in the distribution and that epidemic poliomyelitis must be considered a human borne contagious infection with the portal of entry in the upper respiratory tract, especially in the nasal pharyngeal mucous membrane. Of course, passively it can be carried by becoming attached to bedding, clothes, pets, insects and dust.

Leegaard in 1899 first called attention to the fact that infection apparently spread along lines of travel. Since that time this has been the prevalent theory in epidemiology. All evidence seems to point to the fact that epidemics have travelled along great arteries of commerce and travel, along waterways and railroads. Wherever case studies have been carried out, intimate intercourse of households and meeting places have been the main ways of spreading the disease.

In this connection it would not be amiss to give the experience of New York City Department of Health in the isolation of children of institutions. They isolated ninety-three institutions for the care of children with a total census of 21,746 children and seventy-six institutions for the temporary care of children which had a total census of 6,365 children. These institutions were un-

der strict control and supervision of the Department of Health. From a careful study of these institutions they conclude that "Isolation of groups of children from contact with other children or adults, even when carried out in the midst of areas where the disease is prevalent, suffices to protect such children almost absolutely from infection in spite of the use of identical water and food supplies and exposure to the same atmospheric conditions and winged insects."

Two additional examples of the efficiency of isolation are as follows: "There were between eighty and ninety children on Governor's Island, the United States Government military post, throughout the 1916 epidemic. They were living under as nearly ideal sanitary conditions as may well be obtained. Absolute exclusion of all children visitors from the Island was maintained from July 4th. The children of the Island were not allowed to leave until the middle of September. No case developed."

A second example of the results of isolation is as follows: "There were 350 children, under sixteen years of age, on Barren Island in Jamaica Bay, Borough of Brooklyn. To this Island all the city garbage and offal is taken for reduction in the large rendering plants. Flies and mosquitoes are abundant. Rats are numerous. There is no public water supply and there are many shallow surface water wells. There is no sewerage system. There are few, if any, cellars. There is no garbage collection. There are no public highways. The population of about 1,300 people represents the lower grade of unskilled labor, Poles, Italians and negroes predominating. The standard of living is low. No cases of poliomyelitis developed on Barren Island."

The carrier is probably a larger factor in distributing the infection than are the paralyzed or those confined to bed during the active period. We know that very much the same is true of other contagious diseases such as diphtheria and scarlet fever, for although these, like poliomyelitis, are not highly contagious, they are undoubtedly spread by healthy carriers. As far as our present knowledge goes we must accept the probability of a human agent being the most important in the transmission of the disease.

Poliomyelitis is a disease which attacks children under ten years of age, about 90 per cent of all cases occurring under this age. In the New York epidemic of 1916, 83 per cent under five years and only 2.5 per cent over sixteen years. However, in various epidemics such as that of Norway in 1911, 25 per cent of all cases were adults. The more epidemics are studied, the more certain it is that the greater number affected have no

paralytic symptoms. Where one child in a family shows such definite symptoms, several of the family will show very mild non-paralytic or abortive symptoms. Epidemics differ in severity and extension. At times we have had mild epidemics spreading over the whole country and at other times the epidemic has been very severe in type and confined to a particular section of the country. Large communities are seldom entirely free from it.

Mortality. It is very important not to make any definite prognosis early in poliomyelitis as it is impossible to say during the acute stage what the outcome will be. A case which may begin very mildly may develop rapid ascending paralysis and end fatally, whereas a case which begins with convulsions may in a day or two subside with little or no paralysis. The mortality in the various epidemics has varied widely, ranging from 8 per cent in the Massachusetts epidemic of 1910 to over 26 per cent in the New York epidemic of 1916. The mortality by ages also varies greatly. In the New York epidemic 43 per cent of deaths were between one and two years. In this same series 81 per cent died during the first week, the greatest number of deaths being on the third, fourth and fifth days, 11 per cent died during the second week. The reason for the variation in the mortality rates is due to the difference in the virulency of the virus. This has been demonstrated in experimental work. When virus is first obtained from man the percentage of monkeys which can be infected is comparatively small. As it passed through successive generations of monkeys, the virulency greatly increases. After a time, it again loses its virulency for monkeys. Epidemics follow the same rise and fall as shown in the number of cases as well as in the mortality rate.

From experimental studies it would appear that the incubation period varied from three to ten days, the average occurrence being from five to seven days. Clinical experience supports this. Cases have been reported as early as 24 hours after contact and as late as sixteen or eighteen days.

The **symptoms** may be those of a simple general infection. Temperature is usually present at the onset, ranging between 101° and 103° F. This temperature usually comes down by crisis within a few days though it may run for several weeks. At times the first symptom is that of lassitude or drowsiness. These periods may be interrupted by periods of restless irritability and even convulsions. In some cases the meningeal irritation may be very prominent and resemble the onset of meningitis. In other cases there are no mental symptoms, the child being bright and mentally active. In young infants, vomit-

ing and diarrhea may usher in the attack, though constipation is more often present than diarrhea. In older children, headache and general muscle pains are present.

The paralytic stage. After the systemic phase there may be a period of well-being or it may pass directly into the paralytic stage. There is no symptom outside the appearance of paralysis itself that indicates the onset of paralysis. Of those who are going to develop paralysis, about 75 per cent develop it on or before the fourth day. The paralysis may be perfectly evident or it may only be found after careful searching. It may be limited to a single muscle, a group of muscles or it may be generalized. Many more cases have partial paralysis than complete. The paralysis is always of the flaccid type and more often affects the lower extremities than the upper. During the acute stage the extent of the paralysis is difficult to estimate.

A stationary stage follows the acute period in which it is equally difficult often to determine the extent of the paralysis until atrophy develops. During this period tenderness or pain may continue. The only positive way to determine the extent of the paralysis is by measuring the amount of paralysis by electrical reactions or by means of a spring balance. Improvement may occur fairly rapidly and in a few days or weeks the paralysis may have disappeared, or there may be few or no changes. The amount of recovery also varies in the different epidemics. From Massachusetts only 16.7 per cent of the cases were reported as completely recovered, whereas in the New York epidemic there was a total recovery of 32.6 per cent of the cases discharged from the hospitals. The final recovery rests upon how carefully treatment is carried out in the convalescent and chronic stages. The first six months shows the greatest improvement, after this progress is slow.

Immunity. One attack of poliomyelitis usually gives active immunity. Passive immunity may be obtained by the injection of blood serum obtained from an individual who has just recovered from the disease, although this has a limited field.

Treatment. Treatment must be divided into that for the acute stage, the convalescent stage and the chronic stage. So far the only specific treatment suggested has been the use of serum. This has been tried out in a few epidemics, in some with encouraging results. The serum has been injected both intraspinally and intravenously. Where it has been given in the pre-paralytic stage the results have been far better than after paralyses have developed. When this has occurred the two important things are complete rest and prevention of deformities.

There is more harm done by trying to do too much than by trying to do too little. During the period when there is pain or tenderness there should be no attempt at massage or electricity. By complete rest the cord would be given the best chance to begin repair. The prevention of deformities should be begun as soon as paralysis is noted by watching the position in which the child lies in bed. For instance "foot drop" can be prevented by supporting the bottom of the foot and raising the bed clothes. During the convalescent stage massage, electricity, heat and muscle training are gradually instituted. The chronic stage includes muscle training, corrective exercises, the wearing of braces and occasionally operations.

Epilepsy. Epilepsy is a frequent nervous condition which in two-thirds of the cases is hereditary in nature. Syphilis, alcoholism and other nervous disorders are often found in the family history of epilepsy showing the unstable background for most epileptics. In rare cases an injury to the brain may be the cause of epilepsy, but the history of injury which is almost always given by the family plays little part. The type of brain injury that does play a part in epilepsy is the injury to the brain at birth, either from long, hard labor, cerebral hemorrhage or instrumentation. Cerebral hemorrhages may result not only in epilepsy but in spastic paralysis. Epilepsy may also develop after an acute disease especially when this has been complicated by encephalitis. Epilepsy may appear at any age but its first appearance is usually after the child has started to school, or in early adolescence. Epileptic attacks may be grouped in three classes: (a) major attacks (grand mal), (b) minor attacks (petit mal), (c) epileptic equivalents. These equivalents take various forms—from a momentary dazed interval to hysterical or neurasthenic manifestations.

The epileptic seizure or attack is really an explosion of the whole central nervous system as the typical picture of a seizure shows. The patient usually has certain sensory symptoms which he learns to recognize as always leading to the attack. These prodromal symptoms are sometimes auditory. The patient *hears* music, or distinctive sounds or he may *see* certain objects in certain relations that are the warning sign. Then follows the initial cry, and almost immediate loss of consciousness. The pupils of the eyes dilate and there is no reaction to the opening or closing of the eye. Then follows the tonic spasms of single continued involuntary contraction of the muscles producing a general rigidity of the body, or unilateral or partial rigidity,

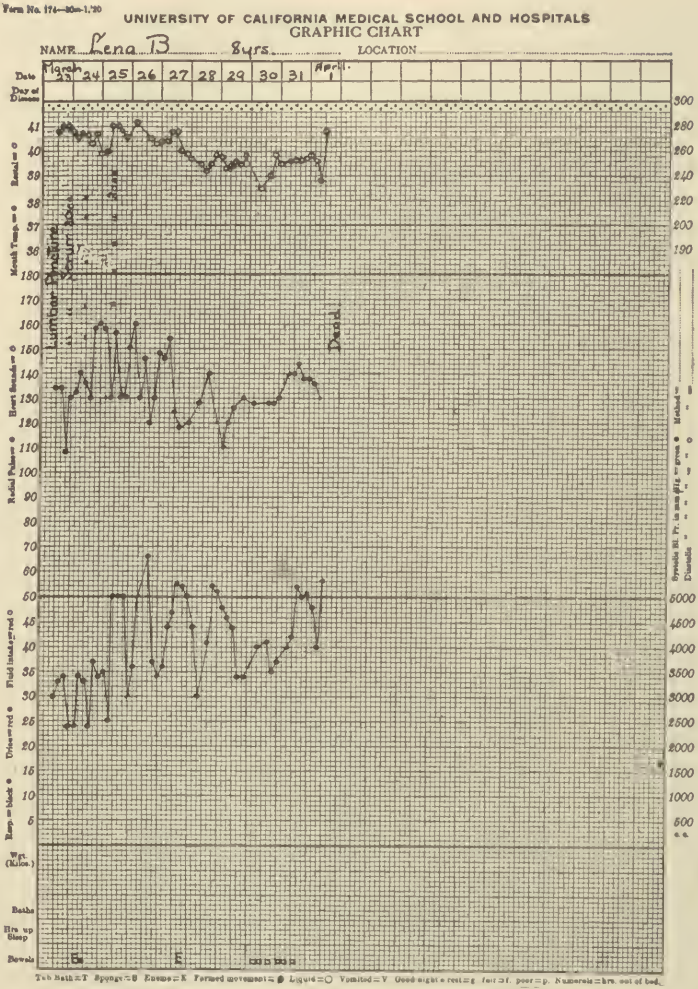

Chart 17.

Legend for

Lena B. (Hospital No. 11057)

Age: 8 years.
Diagnosis: Acute Streptococcus meningitis.

Lena B. was an Italian child who three months before admission had had an acute otitis media followed by mastoiditis for which she had been operated. She had apparently recovered and been well until three weeks before admission when she developed symptoms again of acute otitis media and had a discharge from the right ear for the last two weeks. On admission, her right ear was discharging. She had a temperature between 40°C. (104°F.) and 41°C. (105.8°F.) with marked spasticity of the neck muscles. Kernig's sign was positive, spinal puncture disclosed spinal fluid

culty. The child may at times wave its arms but as the reflexes diminish or become entirely negative the muscles entirely lose their rigidity and the body seems to collapse and the state of coma deepens. It becomes impossible to feed the child by mouth as the ability to swallow is gone. By this time, the temperature may rise sharply, the pulse increases in feebleness and rapidity, and the end will come quickly in acute convulsions or in a series of clonic movements or twitchings, or even coma. With low temperature the end comes more slowly, the child seems to die from the overwhelming exhaustion apparent in the complete relaxation of the body.

Simple acute meningitis (Chart 17) is a type of meningitis caused by one of the ordinary pyogenic organisms and is usually spoken of as streptococcus, staphylococcus, or pneumococcus meningitis according to the causative agent. The various infections have an almost identical set of symptoms and it is therefore possible to discuss them as a whole although more exact diagnosis is not based upon these clinical manifestations but the bacteriological findings.

Diagnosis. Positive diagnosis is made by examination of the spinal fluid by lumbar puncture. In simple meningitis the spinal fluid under moderate pressure is cloudy with a thick fibrin clot. Specific organism are usually quickly found.

The disease may extend over several weeks although the average duration is less than a week as the infection occurs either by way of the blood stream from local infections or by way of a general septicemia which is rapid in development. Any infection near the meninges such as an otitis media and mastoid involvement may lead to an extension of the infection to the meninges. The onset will be as a rule the same sudden one we have described with usually vomiting, high fever with stupor in convulsions and the usual fatal ending. Meningococcus meningitis has usually more marked rigidity of neck muscles.

Epidemic Meningitis (Cerebrospinal fever—Spotted fever). Epidemic meningitis like all infectious diseases has various forms, abortive, mild, severe and malignant. They are all equally capable of transmitting the disease although the ease with which the disease is transmitted varies. The meningococcus is the causative organism.

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increased in quantity and very cloudy. Examination of spinal fluid showed pus cells and streptococci. Culture also showed non-hemolytic streptococcus. She was given anti-meningococcic serum without any effect. Her temperature remained quite high. She died on the tenth day after admission.

The disease results from the entrance of the organism into the body by way of the nose and throat. This renders transmission easy as the organism may be cultured from those membranes in the early stages of the disease. Epidemics may be widespread or cases may appear sporadically here and there. It is a disease of young childhood, three-fourth of the cases occur under ten years.

The **symptoms** of the ordinary form of epidemic meningitis are typical. The onset will occur in usually less than a week after exposure, and the prodromal symptoms are usually fever, great prostration, severe pains in head, neck, back and legs, vomiting frequently followed by convulsions. Rigidity of the entire body and opisthotonos are marked. The child will scream when moved and there are times of marked delirium followed often by drowsiness or complete coma. Herpes is not an uncommon occurrence. In severe cases purpuric eruptions appear and in certain epidemics erythematous spots distributed all over the body have given it the name of spotted fever. If no treatment is given, death comes quickly in the severe cases. In milder cases the child may live several weeks and then die of inanition or of other complications. Recovery is slow, the temperature and nervous symptoms gradually disappear and the end result may be a cripple physically and mentally. Such results are fewer, since the discovery and use of specific treatment, early.

Treatment. The early use of antimeningococcic serum has reduced the high mortality of epidemic meningitis among children and the crippling results upon recovery have been reduced. Before its introduction the mortality varied from 40 to 80 per cent, now the mortality is about 20 per cent. If the serum is given within the first 12 to 48 hours of the onset, the recovery is often as by crisis. The serum is given intraspinally, into the ventricles and intravenously. The usual route is the intraspinal. About as much serum warmed to the body temperature is given by the gravity method as the amount of spinal fluid withdrawn. The other routes are used in more severe cases.

The higher mortality in infants is due to the fact that the inflammatory process is much more likely to obstruct the normal circulation of the spinal fluid and produce hydrocephalus. The serum in such cases should be introduced into the ventricles. When serum acts successfully the symptoms, fever, vomiting and rigidity disappear about as rapidly as the spinal fluid clears up, this being a good indication of the results.

When the treatment fails to give satisfactory results a

number of reasons are usually factors in the situation. The child may have an *overwhelming* infection, in which too much damage has been done before the injection of the serum. The serum used may not contain antibodies specific for the strain of meningococcus affecting the patient. Or again the meningococci may be walled off in some part of the ventricle or subarachnoid systems inaccessible to serum treatment, and finally there

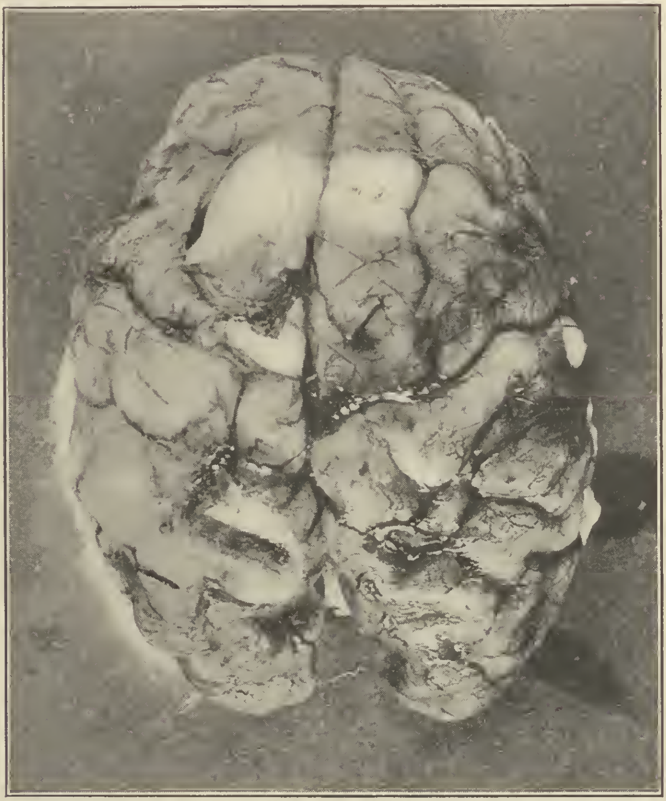

Fig. 146.—Brain showing thickening of meninges from acute meningitis.

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Encephalitis. In infancy and childhood the involvement of the central nervous system is not always caused by these pyogenic organisms we have discussed. Toxic or irritative involvement of the central nervous system is not uncommon. During any acute infection especially such infections as pneumonia, central nervous symptoms due to toxic or irritative products may arise

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Poliomyelitis (Spinal infantile paralysis, epidemic poliomyelitis, anterior poliomyelitis, infantile paralysis).

Etiology. Infantile paralysis is caused by a filterable virus and an ultramicroscopical organism producing an acute inflammation of the central nervous system.

The virus is unknown apart from infected human beings. It possesses a high degree of resistance both to cold and ordinary degrees of heat for long periods. It withstands drying very well if enclosed in albuminous matter, which probably accounts for its prolonged vitality in the naso-pharyngeal tissue. It can stand both moist and dry conditions and can therefore be carried into the upper respiratory tract as a spray produced by coughing, sneezing and loud speaking, and as dust. It is evident from all the experimental work that other agents than man play a minor part in the distribution and that epidemic poliomyelitis must be considered a human borne contagious infection with the portal of entry in the upper respiratory tract, especially in the nasal pharyngeal mucous membrane. Of course, passively it can be carried by becoming attached to bedding, clothes, pets, insects and dust.

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Poliomyelitis is a disease which attacks children under ten years of age, about 90 per cent of all cases occurring under this age. In the New York epidemic of 1916, 83 per cent under five years and only 2.5 per cent over sixteen years. However, in various epidemics such as that of Norway in 1911, 25 per cent of all cases were adults. The more epidemics are studied, the more certain it is that the greater number affected have no

paralytic symptoms. Where one child in a family shows such definite symptoms, several of the family will show very mild non-paralytic or abortive symptoms. Epidemics differ in severity and extension. At times we have had mild epidemics spreading over the whole country and at other times the epidemic has been very severe in type and confined to a particular section of the country. Large communities are seldom entirely free from it.

Mortality. It is very important not to make any definite prognosis early in poliomyelitis as it is impossible to say during the acute stage what the outcome will be. A case which may begin very mildly may develop rapid ascending paralysis and end fatally, whereas a case which begins with convulsions may in a day or two subside with little or no paralysis. The mortality in the various epidemics has varied widely, ranging from 8 per cent in the Massachusetts epidemic of 1910 to over 26 per cent in the New York epidemic of 1916. The mortality by ages also varies greatly. In the New York epidemic 43 per cent of deaths were between one and two years. In this same series 81 per cent died during the first week, the greatest number of deaths being on the third, fourth and fifth days, 11 per cent died during the second week. The reason for the variation in the mortality rates is due to the difference in the virulency of the virus. This has been demonstrated in experimental work. When virus is first obtained from man the percentage of monkeys which can be infected is comparatively small. As it passed through successive generations of monkeys, the virulency greatly increases. After a time, it again loses its virulency for monkeys. Epidemics follow the same rise and fall as shown in the number of cases as well as in the mortality rate.

From experimental studies it would appear that the incubation period varied from three to ten days, the average occurrence being from five to seven days. Clinical experience supports this. Cases have been reported as early as 24 hours after contact and as late as sixteen or eighteen days.

The **symptoms** may be those of a simple general infection. Temperature is usually present at the onset, ranging between 101° and 103° F. This temperature usually comes down by crisis within a few days though it may run for several weeks. At times the first symptom is that of lassitude or drowsiness. These periods may be interrupted by periods of restless irritability and even convulsions. In some cases the meningeal irritation may be very prominent and resemble the onset of meningitis. In other cases there are no mental symptoms, the child being bright and mentally active. In young infants, vomit-

ing and diarrhea may usher in the attack, though constipation is more often present than diarrhea. In older children, headache and general muscle pains are present.

The paralytic stage. After the systemic phase there may be a period of well-being or it may pass directly into the paralytic stage. There is no symptom outside the appearance of paralysis itself that indicates the onset of paralysis. Of those who are going to develop paralysis, about 75 per cent develop it on or before the fourth day. The paralysis may be perfectly evident or it may only be found after careful searching. It may be limited to a single muscle, a group of muscles or it may be generalized. Many more cases have partial paralysis than complete. The paralysis is always of the flaccid type and more often affects the lower extremities than the upper. During the acute stage the extent of the paralysis is difficult to estimate.

A stationary stage follows the acute period in which it is equally difficult often to determine the extent of the paralysis until atrophy develops. During this period tenderness or pain may continue. The only positive way to determine the extent of the paralysis is by measuring the amount of paralysis by electrical reactions or by means of a spring balance. Improvement may occur fairly rapidly and in a few days or weeks the paralysis may have disappeared, or there may be few or no changes. The amount of recovery also varies in the different epidemics. From Massachusetts only 16.7 per cent of the cases were reported as completely recovered, whereas in the New York epidemic there was a total recovery of 32.6 per cent of the cases discharged from the hospitals. The final recovery rests upon how carefully treatment is carried out in the convalescent and chronic stages. The first six months shows the greatest improvement, after this progress is slow.

Immunity. One attack of poliomyelitis usually gives active immunity. Passive immunity may be obtained by the injection of blood serum obtained from an individual who has just recovered from the disease, although this has a limited field.

Treatment. Treatment must be divided into that for the acute stage, the convalescent stage and the chronic stage. So far the only specific treatment suggested has been the use of serum. This has been tried out in a few epidemics, in some with encouraging results. The serum has been injected both intraspinally and intravenously. Where it has been given in the pre-paralytic stage the results have been far better than after paralyses have developed. When this has occurred the two important things are complete rest and prevention of deformities.

There is more harm done by trying to do too much than by trying to do too little. During the period when there is pain or tenderness there should be no attempt at massage or electricity. By complete rest the cord would be given the best chance to begin repair. The prevention of deformities should be begun as soon as paralysis is noted by watching the position in which the child lies in bed. For instance "foot drop" can be prevented by supporting the bottom of the foot and raising the bed clothes. During the convalescent stage massage, electricity, heat and muscle training are gradually instituted. The chronic stage includes muscle training, corrective exercises, the wearing of braces and occasionally operations.

Epilepsy. Epilepsy is a frequent nervous condition which in two-thirds of the cases is hereditary in nature. Syphilis, alcoholism and other nervous disorders are often found in the family history of epilepsy showing the unstable background for most epileptics. In rare cases an injury to the brain may be the cause of epilepsy, but the history of injury which is almost always given by the family plays little part. The type of brain injury that does play a part in epilepsy is the injury to the brain at birth, either from long, hard labor, cerebral hemorrhage or instrumentation. Cerebral hemorrhages may result not only in epilepsy but in spastic paralysis. Epilepsy may also develop after an acute disease especially when this has been complicated by encephalitis. Epilepsy may appear at any age but its first appearance is usually after the child has started to school, or in early adolescence. Epileptic attacks may be grouped in three classes: (a) major attacks (grand mal), (b) minor attacks (petit mal), (c) epileptic equivalents. These equivalents take various forms—from a momentary dazed interval to hysterical or neurasthenic manifestations.

The epileptic seizure or attack is really an explosion of the whole central nervous system as the typical picture of a seizure shows. The patient usually has certain sensory symptoms which he learns to recognize as always leading to the attack. These prodromal symptoms are sometimes auditory. The patient *hears* music, or distinctive sounds or he may *see* certain objects in certain relations that are the warning sign. Then follows the initial cry, and almost immediate loss of consciousness. The pupils of the eyes dilate and there is no reaction to the opening or closing of the eye. Then follows the tonic spasms of single continued involuntary contraction of the muscles producing a general rigidity of the body, or unilateral or partial rigidity,

clonic spasms appear next in the *series* of these involuntary contractions producing a spasmodic jerking of the body generally or in part, or on one side only. This is followed by a respiratory spasm which causes asphyxia and the patient turns blue. The muscles of the jaw contract, causing the biting of the tongue and foaming of the mouth. Then the spasm slowly relaxes, the movements becoming clonic, then intermittent. Involuntary passage of urine and feces takes place. Then comes the gradual recovery of consciousness and the patient may be in a state of stupor or sleep. The entire seizure lasts only a few minutes. The deep reflexes are diminished or increased. Often the patient is in a state of complete exhaustion for hours after a seizure.

Treatment. The prevention of the attacks is of first consideration and the time between seizures may be greatly lengthened by general care; the avoidance, if possible, of any general disturbance of health such as indigestion or gastro-intestinal conditions which throw off toxic material in the intestinal tract which are absorbed by the system and made an irritative factor; the avoidance of any eye strain, or any intense mental excitement, or physical fatigue; the maintenance of good hygienic conditions of life and the establishment of regular habits; in children the avoidance of masturbation or any sexual emotional excitement, all these are valuable aids in preventing the overaction of the cortical cells which causes the seizure. In other words, the epileptic case must lead as quiet a life as possible, free from excitement, worry or strain. The drugs most often used are the bromides. The drug with which I have had the best success is luminol. This is a proprietary synthetic product and does not have the depressing effect of bromides and seems to control the seizures better in most cases.

Pathologically the picture is one of general degenerative changes, depending in their rapidity upon the frequency of the seizures. A child will not show any such changes from the first two or three attacks perhaps but as the seizures extend over longer periods slowly the child shows the effect in lessened mental and physical powers. The earlier the child has the attacks, the more damage is done to the rapidly growing brain and central nervous system.

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CHAPTER XII

MENTAL CONDITIONS IN INFANCY AND CHILDHOOD

From earliest infancy we have in our discussion traced the slowly developing, slowly stabilizing brain and central nervous system, the heart growth, the muscle development, the child's whole physical development. In our discussion of the nervous system, the disorders and diseases affecting the brain and central nervous systems have been emphasized in relation to the physical changes in the system itself, and the pathological character of these diseases. We have now come logically to the discussion of conditions which have definite mental manifestations which determine the normality or abnormality of the brain development.

Habits. Habits, both physical and mental, are perhaps the first indications we have of the infant's potential normality or abnormality. We have discussed them in our chapter on normal growth and development as indicative factors of that general process. We discussed *habits* from the angle of the importance of them in relation to hygienic environment necessary for normal growth and development. Now we will briefly consider habits as indicative of mental conditions, not diseases, and which have a direct relation to the environmental and moral surroundings of the child. Certain habits arise from imitation. A child is very much influenced by what he sees and hears. Many so-called *ticks* are habits consciously or unconsciously copied from others, winking of the eyes, sucking the lips, twitching of face, humping of one shoulder or shrugging of both shoulders, have all been traced in many instances to other individuals in the child's environment who did any one of these movements.

Speech disorders are often spoken of as mere bad habits and not as real functional disorders when the truth is they may be either. Stammering is often caused by some defect of teeth, lips, tongue or palate or it may be caused by fright, nervousness, imitation, the result is the same; the individual sound is difficult to make. Occasional stuttering is very common in little children before they can speak distinctly and in this condition there is no difficulty in making the individual sound but the effort to put syllables together causes the stuttering. This may

be often an imitative habit, or inheritance may be a factor, or it may actually indicate degeneration of faculties. Lisping is another speech disorder commonly found in mild forms which may have either physical or mental cause or both. Actual loss of speech, *aphasia,* has been found from fright or acute illness or long nutritional disturbances in young children.

All these functional disorders of speech, not due to deafness or mental deficiency, may be overcome with care and patience and regulation of the physical life of the child. Special speech training and recognition of the mental aspect of many of them will prevent these so-called bad habits from preventing the child's normal happy development. The child's whole moral and intellectual development can be affected by stupid handling of any of these ticks or speech disorders.

Some children later found in juvenile courts, learned to *steal* because some speech disorder made asking for things a torture. Stealing is often, in juvenile court cases, found to be a habit formed early from imitation, or fright, or excessive punishment, and not a mental or moral defect at all.

Masturbation is a physical habit with often a mental and moral result in the child's development. In infancy, it is usually caused by some local irritation caused by long or adherent prepuce, vulvovaginitis, eczema of the labia, acid urine, tight clothing, etc. After infancy, the habit is usually learned from some other child or vicious adult. In infancy mechanical restraints and constant supervision can overcome the habit. In children who are old enough to be conscious that they are doing something wrong, the treatment is most difficult. Early recognition of it by the nurse or mother is most important but never *early impression* of the habit upon the child's mind. Every effort should be made to get the child's mind off the habit by careful, general care of the physical regimen; play and happy substitutes in interests; never accusing the child of the habit but anticipating any indulgence in the habit, not by spying on the child but by a frank, confident relation with the child which will emphasize love, patience and understanding and belief in the child's own ability to break the habit, and not suspicion and condemnation and harshness of treatment that will result surely in the moral degeneration of the child's character. Mental depression, lack of concentration, loss of interest in the normal usual activities of childhood are some of the accompanying mental conditions of masturbation. The child's whole nervous system may be affected by this habit, just as any general upset of the child's nervous system may *cause* the formation of the habit. Both must be considered in the effort to break this habit.

The effort to break this habit must not at the same time break the child's will, spirit and self-respect.

Any of these habits and disorders may be factors in definite retardation in the child's development especially when caused by definite physical defects which cannot be entirely overcome. But most of these conditions we have discussed may be affected more quickly and more favorably by early recognition of the mental condition involved.

Retardation caused by actual mental deficiencies is the type of retardation most frequently found in children. In the vast majority of cases these are definitely hereditary and (Fig. 147) the problem of the feebleminded is therefore, largely a eugenic one. Mental defectives can be put into the following classes:

First: **Idiots.** These cases have the mental age of from zero to three years by the Binet-Simon intelligence test. The diagnosis is easily made and these cases are entirely institutional.

Second: **Imbeciles.** These cases have the mental age of from three to seven years according to the Binet-Simon scale and are easily diagnosed. Those children in the upper grades of this test may be educated mechanically so that they may be self supporting, but in the majority of cases they need institutional care. The percentage of idiots and imbeciles among children is from 1 to 2 per cent.

Third: **Morons.** These cases are from seven to eleven or twelve years of age by the Binet-Simon scale and are capable of considerable education. These cases form a large group largely unsuspected because they are most difficult to diagnose, and the various grades are difficult to determine. Among children, about 7 per cent are morons, but we have about 17 per cent of children who are "dull normal" and it is difficult to determine when the child ceases to be a "dull normal" and becomes a high grade moron. For this reason, the moron class is of the greatest importance from the social standpoint. Most of the cases in our juvenile courts are from this group. They are institutional cases or should be under close observation. They are unable to form judgments and their volition and higher powers or faculties are lacking or defective. Study of the education possible for the moron group is of great economic importance to the state, as this large group can be trained to be industrially self-supporting and cease to be a drain upon the public resources. The problem of the supervision of these morons in their education and later employment is of vital importance to society.

Fourth: **Psychological Cases or Defectives.** This group comprises a rather large number of cases which cannot be called

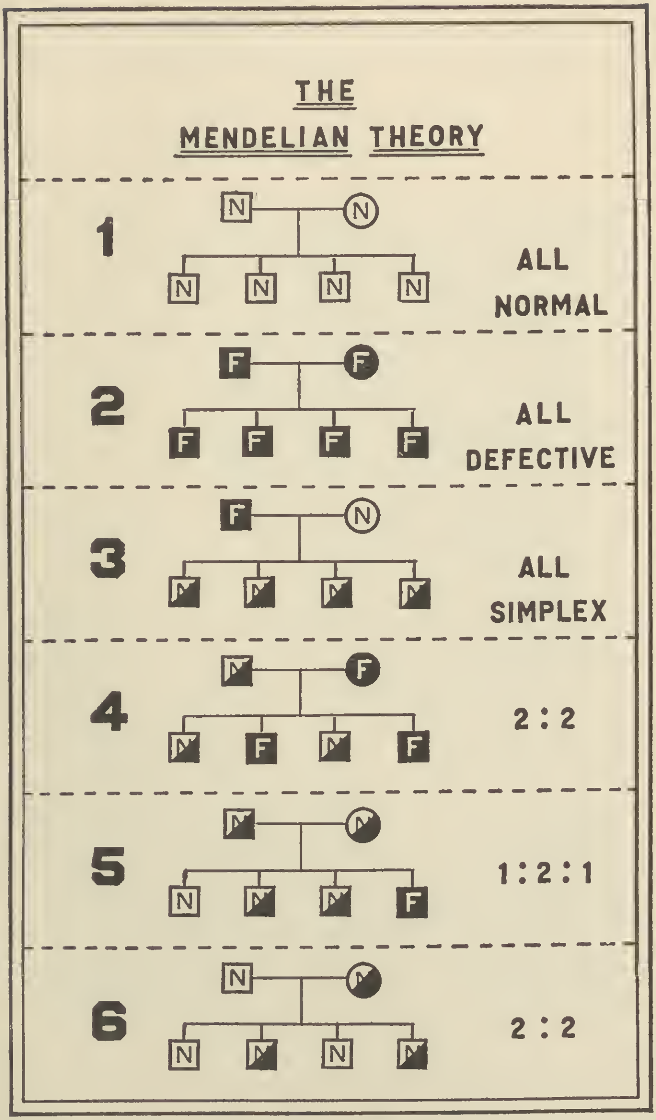

Fig. 147.—Chart showing the Mendelian theory. (From book, "Feeble-Mindedness, Its Cause and Consequences," by Goddard. Published by The Macmillan Company, 1914. Chart on page 549.)

mentally defective but which are defective in some of their higher mental or volitional faculties. These cases appear sooner or later in either our juvenile courts or in our psychopathic hospitals. Early recognition of these cases and training and education would do much to prevent the inevitable clash with the social order that comes when these cases go unrecognized and unsupervised.

Insanity. Insanity often has its beginning during childhood, especially during the adolescent period. At the present time a great deal of attention is being given to the early beginnings of insanity during childhood, and a great many of our present investigations show that many of our cases of insanity during adult life have had their roots in childhood and particularly during adolescence. Out of 3,244 adult patients, 4 per cent were insane in childhood and of that 4 per cent only twelve were detected during childhood. Usual sensitiveness and irritability of the youthful mind is more than adolescent instability often, and recognition of this and proper treatment of early conditions is essential. The word *nervous* has for too long a time been used to camouflage early symptoms of insanity which might have been advantageously affected by a well balanced hygienic life, free from mental and physical fatigue and irritation.

Insanity may be due to heredity or it may be acquired. Acute infectious diseases such as meningitis, or otitis media may predispose to the development of insanity. Epilepsy, hysteria, chorea, intense emotional excitement, any habit, such as masturbation, which lends itself to rapid deterioration may all be factors in the development of acquired insanity.

The most common type of insanity is that of definite imperative conception such as fears of contamination, poisoning persecuting and these lead to very imperative action. During school age the cerebral neurasthenia is found with a history usually of hysterical and neurotic parentage.

Melancholia is a mild type of insanity, present more often among girls at puberty and usually preceding the menstruation period. The prognosis for this is favorable with quiet, supervised life and diversions.

Dementia praecox is the most common insanity during childhood and adolescense. Heredity is one of the largest factors usually with alcoholism or syphilis in the history. It may be due to other factors such as acute infectious diseases and conditions mentioned above. It is characterized by periods of depression with hallucinations and delusions. The Paranoia form of extravagant ever-changing delusions is easily recognized, and these may swing from the excitement of real manias to the melancholias

Mongolian idiocy (Fig. 148) is a type of congenital idiocy characterized by the peculiar Mongolian face, with the slant eyes, the most predominant features. Short, spade-like hands, deformities of the ears, and general underdevelopment are present. The intelligence of these cases is usually below three years. They have little resistance to disease and the majority of them die in infancy and early childhood.

FIG. 148.—Mongolian idiot.

Amaurotic Family Idiocy. This is a hereditary condition and is limited almost entirely to the Jewish race. The mental and physical deterioration usually begins about the sixth month and is characterized by a marked and generalized degeneration of the nerve cells and tissues. The characteristic point in these cases is the appearance of the cherry red spot in the macula lutea in the eye ground. There is a progressive mental deterioration

and paralysis or pseudo-paralysis of the greater part of the body with the reflexes definitely increased. The diminution of vision terminates in absolute blindness. There is usually marked atrophy and marasmus. These cases all end fatally.

Cretinism should be definitely differentiated from these last conditions. Cretinism, if undiagnosed and untreated, will of course produce idiocy, but cretinism is a condition which depends on the absence or deficient activity of the thyroid gland and is definitely characteristic in its signs and symptoms. We will discuss this condition in the chapter on Internal Glands.

Deaf mutism is a condition in many cases of idiocy and often the condition is not suspected but laid to other reasons. Deaf mutism, like idiocy, may result either from acquired disease or be a congenital condition and this differentiation is important in the individual history of the child and in the care and training possible for him to have. Acquired deaf mutism comes most frequently, as we have said, from scarlet fever and acute otitis media. The younger the child loses his hearing, the earlier is speech lost and if a child, not an idiot, fails to talk by the end of the second year, and some acute infectious disease such as scarlet fever, diphtheria, measles or even mumps have been part of the history, deaf mutism is undoubtedly present, and methods for teaching the child to speak should be begun.

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CHAPTER XIII

DISEASES OF THE INTERNAL GLANDS

1. The internal glands are known by the results which they produce when they are deranged or functioning abnormally rather than from any direct action which we are able to measure. The exception to this is the action of the thyroid glands. Internal glands are so named because they have or are supposed to have an internal secretion. This internal secretion plays an important part in the proper functions of the other organs. These substances secreted by the internal glands are called " chemical messengers" or harmones which comes from the Greek word to excite or arouse. From a clinical standpoint, certain sets of results (syndromes) appear which are caused by a hyper (excessive) secretion or by a hypo (diminished) secretion, or by some change in its normal physiological action which in our present knowledge of the internal glands is not understood. When a single gland is involved, the clinical results can be fairly definitely recognized, but when several glands are involved as is often the case, the clinical results are very confusing.

The thyroid gland converts the iodin of the food into a special organic compound, idiothyroglobulin, which has a specific action on the nervous system, particularly that part (vegetative) which controls the oxidation of the cells and the general musculature, and also upon the activity of other internal glands. With this physiological function of the thyroid in mind, it is easier to understand the symptoms of hyper and hypo secretions. In hypersecretion the oxidation of the body is increased, i. e. the metabolism of the body increases anywhere from 20 to 100 per cent and this causes the symptoms which make the diagnosis clear cut. This also explains why there is an increased pulse rate (tachycardia) fine tremors, excessive nervousness, bulging of the eye ball. With these symptoms, there is, in most cases, an enlargement of the thyroid gland. Hypersecretion rarely occurs before the age of fifteen years and then it usually appears in the adolescent girl. The condition of hyperthyroidism is more common among girls than boys. There is a type of physiological enlargement of the thyroid which is found in children in certain regions; in America along the Great Lakes,

and some parts of the Pacific Coast; in Switzerland especially, and in other parts of the world. In these regions, it is supposed to be due to the mineral content of the water. These regions are often known as goiter regions. Many of these cases do not show any signs of hypersecretion, though in these regions, the number of cases suffering from hypersecretion are always greater in number than ordinarily found in normal populations. Marine, in his studies on the Great Lakes region demonstrated that the enlarged thyroid of school children could be prevented or diminished in size by giving two short courses of ten days each, twice a year, of sodium iodide.

Hypothyroidism is a type of thyroid derangement most often seen in infancy and early childhood. When there is a deficient secretion of the thyroid in the child, normal development is impossible. All the processes of growth are slowed down; the long bones fail to grow to their proper length; ossification of the centers of the ankle and wrist fail to develop; the general metabolism is under normal; the child becomes sleepy and lethargic, and grows fat. The skin of the child changes in texture, becoming rough and dry, and thickened. The face has a peculiar expression with wrinkled forehead, mouth held open, the tongue protruding and thickened causing constant drooling. The nose broadens and the nostrils are distended. The hair on the head loses its luster and grows low on the forehead, the head may increase in size, giving the already dwarfed body a top-heavy appearance, although the tissues of the body remain fat. The circulation is poor, often showing blue lips, and cold hands and feet. These children are also mentally dwarfed and retarded. Such a condition is known as *sporadic cretinism,* and is due to an aplasia of the thyroid gland. The cases are spoken of as cretins. As long as these infants are nursed, the thyroid symptoms do not appear or do not develop completely as sufficient thyroid secretion seems to reach them through the mother's milk. As soon as the child is given artificial feedings, these symptoms begin to appear though at times the condition may be suspected before the end of the nursing period.

It is very important to recognize the condition early as upon this depends the entire future of the child's life. If the condition is recognized early, the *continued* administration of thyroid extract will produce a normal child who will develop into a normal adult. If the condition is not recognized early and treatment delayed until the symptoms are so definite that the diagnosis is perfectly obvious, then, in most cases, the child never gains actual normality. For this same reason, parents

and adults in care of the child must be impressed with the importance of the *continued* thyroid treatment throughout life.

True cretinism (Fig. 149) is an endemic disease found rather widely distributed, but tending to localize in certain regions such as Switzerland where, in some valleys, nearly the whole population is affected. There appears some relation between true cretinism and the water supply. Certain types of goiters (colloid) are a common finding. The cretin is a short, plump individual with a thick loose skin and heavy face, with thick lips and large tongue. Drooling is a common result of this. The neck is short and the chest is flat and the abdomen is pot bellied. These cretins suffer from marked constipation, a sluggish or low metabolism and obesity.

Thyroid extract is apparently of less benefit in these cases than in the sporadic type. It should be given together with sodium iodide in these regions. Feeble-mindedness is a common finding but fortunately these cases have infantile genitals and a lower sex desire and so do not procreate as successfully as the normal.

Parathyroids. We know very little about the hypersecretion of these glands. When there is a diminished secretion, a definite tetany results. This must be clearly differentiated from the infantile tetany already discussed as being due to the deficiency of calcium in the mineral metabolism. Parathyroid tetany is rare unless we assume that calcium metabolism is connected with the hyposecretion of the thyroid glands which the facts do not supoprt.

Tetany is evidenced by the tonic contractions of the voluntary muscles, sensory disturbances and trophic changes in the hair, teeth and nails. The characteristic carpopedal spasm is present. Laryngo spasm is also present. There is increased electrical reaction of the motor nerves. The administration of bromides and chloral to relieve the spasm, and calcium chloride in large doses (30-60 grains a day) to affect the calcium metabolism, are indicated as in infantile tetany.

The Hypophysical Gland or the Pituitary Gland. This gland is located at the base of the brain, protected by a special bony depression known as the sella turcica. The internal secretion of this gland has a great deal to do with the growth and development of the child. Hypersecretion (hyperpituitarism) in childhood produces an overgrowth of the skeleton, causing gigantism. The bones grow excessively before the ossification of the epiphyseal lines. The X-ray of the skull shows an enlarged sella turcica. Sometimes symptoms of intercranial pressure occur causing headache, diplopia or even blindness. If

FIG. 149.—(by Dr. C. F. Gelston) A Cretin showing marked retardation and abnormalities.

the growth of pituitary gland occurs in adult life acromegaly (expansion and thickening of the bones rather than growth in length) occurs.

The treatment in hypersecretion is removal or resection of the gland, or treating the gland with X-ray exposure.

Hypopituitarism (Fig. 150) usually affects the secretion of the posterior lobe of the pituitary gland. This changes the

Fig. 150.—Internal gland derangement, probably pituitary, showing infantilism.

appearance of the individual; the male skeleton taking on the graceful appearance of the female skeleton; the genitals remain infantile and there is a marked accumulation of fat especially around the abdomen and thighs. This is spoken of as adiposogenitalis and is known as Froehlich's syndrome as Froehlich first described this type. There is some evidence to show that the disturbances in growth and the infantile genitals are due

to hyposecretion of the anterior lobe while the obesity is produced by a hypersecretion of the posterior lobe. This condition is often due to a tumor of the hypophysis in which case removal of the tumor is the best treatment. If there is no tumor but purely a lack of secretion, giving the extract of the gland will help in some cases, to correct the defects. The whole gland may be given if the symptoms point to the involvement of both lobes or extracts from the anterior lobe or posterior lobe may be given separately.

The pineal body, which is also located at the base of the brain, presents very characteristic symptoms when a tumor of the pineal body is present. The characteristic change is the appearance of premature puberty. A child of four with a pineal tumor will have fully developed genitals, pubic and axillary hairs and the emotions of an adult. These results are supposed to be due to a hyposecretion caused by the tumor. Normally the pineal secretion is supposed to inhibit the activity of the hypophysis until puberty, when there is a diminution in the pineal secretion which allows the hypophysis to bring about the maturing of the sexual glands.

The thymus gland is located at the base and anterior part of the heart. In this way it covers, during infancy and early childhood, the beginning of the great vessels. During early infancy an enlarged thymus, from its secretions and its anatomical position may cause serious symptoms and sudden death. This condition is known as status thymicus. An infant with an enlarged thymus may have a peculiar pallor and excessively watery subcutaneous fatty tissue, and a flabby musculature. The lymphatic system is usually hypertrophied. Such infants often given the alarming symptoms of becoming suddenly blue and have a peculiar stridor in breathing as if they were suffocating. Such attacks usually occur in children between the ages of six and twelve months. The attack may come out of a clear sky, no symptoms, or may be preceded by restlessness. In the attack the child throws his head back, his eyes roll up, the pupils are dilated, he struggles for breath, his lips, tongue and face become blue, the veins in the neck stand out and the whole body is bent rigidly backward with the hands clenched. After a few such convulsive movements, the child becomes unconscious. Death may occur within a few minutes of the onset, or the child gradually recovers consciousness and in a few hours is apparently normal.

Such an enlarged thymus may sometimes be palpated, often can be percussed, and always can be seen by the X-ray.

These symptoms described above as resulting from an en-

larged thymus may be due, in part, to mechanical causes, as a sudden engorgement of an enlarged thymus causes pressure on the trachia and great vessels. The enlargement of the thymus does not necessarily mean such an attack. The hypersecretion of such a thymus undoubtedly affects the resisting power of the child. Such children have a lower resistance to infections; their response to the injection of foreign serums such as anti-toxin serum is often followed by an anaphylactic shock; their reaction to an operation with general anesthesia is poor. This change in resistance is also shown by the increase of lymphocytes in the blood which may be as high as 80 per cent (lymphocytosis).

Treatment. The best and perhaps the only satisfactory treatment is the application of X-ray which produces an atrophy of the gland or radium.

These single gland derangements we have described seem simple of diagnosis and, as we have said in the beginning, if a single gland were involved they would be, but when one remembers that these conditions usually involve a number of glands, one sees the many symptoms which would be present and which render diagnosis difficult. Present day literature is full of the discussion and study of internal glands. The future may bring very marked changes in our conception of these conditions.

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CHAPTER XIV

MUSCLE AND NERVE AFFECTIONS

There are a certain number of diseases found in infancy and childhood that are accompanied by muscle changes called dystrophies and atrophies. Many of the conditions are congenital in origin and hereditary in nature. Other more rare conditions affect the bony system. None of these conditions are definitely related to each other but I am grouping them together because they are rare and when they occur they always arouse keen interest and speculation. The nurse will meet them in every big hospital and as these cases become more disabled, the demand on the sympathy and care of the nurse increases. There is no curative treatment. Local symptoms may be treated and the general hygienic care kept at the best level but the conditions are pitiable, and gentleness and tenderness in the nursing care are the brightest spots in the lives of these cases.

Muscular Dystrophies and Atrophies

Muscular atrophies have a number of types that give fairly definite clinical and pathological pictures, and are identified by the location of the chief disability and the general course of the disease. These muscle conditions may be due to cord lesions, to nerve diseases, or to atrophy of the muscle fibres. Some cases may show all or two of these sources as the cause, and with the resulting number of clinical and pathological findings which make diagnosis difficult.

Progressive muscular dystrophy is a familiar disease with the onset in early life. The atrophy seems entirely confined to the muscle and muscle fibres, beginning in the muscles of the trunk and gradually spreading to the thighs, pelvic girdle, shoulder girdle and the upper arms. The child shows extreme weakness but there are no abrupt signs such as fibrillary twitching. The electrical reaction is less in quantity but there is as a rule no reaction of degeneration. The progress of the disease is very slow and may limit itself to any stage and seldom causes death. The cause of this condition is still unknown although certain blood and urine studies have seemed to point to some internal

gland disturbance. McCrudden's work and experiment in treatment in 1918 showed that the condition was at least improved by the administration of adrenalin and pituitary extract, but no final conclusions are possible as yet.

The Charcot, Marie Tooth type of progressive muscular atrophy is found usually in the latter half of childhood when there are frequently severe nerve lesions. The disease is hereditary and familial and boys are more often affected than girls. The condition generally begins with atrophy of the muscles of the foot and extends slowly up the calf muscles. These muscles show the reaction of degeneration and fibrillary tremors are present but sensation is not injured. The course of the disease is slow and not continuously progressive. The hands may not be affected until years after the onset. Gaps in the progress of the disease may be so long that it will almost seem like a cure. Cases live to old age and pass useful industrious lives.

Pseudo Hypertrophic Muscular Dystrophy (Figs. 151–152). This condition usually appears before the tenth year and may occur as early as the second. The first symptom noticed is usually an enlargement of the calf muscles but any of the muscle groups of the lower extrimities may show the first enlargement. The unsteadiness of gait and the ease with which a child falls first calls the mother's attention to the condition. As the condition progresses, the child gets weaker and weaker and it becomes impossible for him to get up from the floor in the usual way but raises himself up in sections as it were, by pushing his body into an upright position with his hands, using first his knees, his thighs, his hips as stepping stones in climbing up. There is nothing that can be done for these children but general care and comfort. They usually live less than ten years after the disease starts.

Congenital Myatonia (Oppenheim's disease). This condition has its beginnings early in infancy and is characterized by a general flaccid paralysis which begins in the lower extremities and extends upward. The infants seem well nourished but will lie quietly for hours without making any movement of the body. Most of these cases die within the first year. Some of the milder types will live for years but the muscular weakness is permanent and incurable.

Congenital myotonia (Thomsen's disease) is quite a different condition. It shows itself by rigidity rather than flaccidity of the muscles. The first signs are usually noticed between ten and twelve years of age. The form is what we might call a muscle hesitation. The child will have difficulty in making the initial move, in walking the taking of the first step is a difficult jerking

motion but after the first two or three steps, he moves along smoothly. Any group of muscles may be affected but it is usually the muscles of the legs. The condition gets worse during adolescence. It is incurable but seldom causes death. Exercises

FIG. 151.—Pseudo hypertrophic muscular dystrophy. Boy making first effort to raise himself.

and massage, all the modern development of physiotherapy will aid these cases.

Hereditary Ataxia (Friedreich's ataxia). This condition has a strong hereditary tendency and often more than one member of a family will suffer from the same condition. The pathologi-

cal changes are always in the spinal cord and these vary greatly. The unsteady or ataxic gaits is the most pronounced symptom. To stand at all the child must stand w·th his legs wide apart,

FIG. 152.—Same boy in characteristic attitude of pushing himself into an upright position. Note large calf and small upper arm.

and in walking has the rolling gait of a sailor on a stormy deck. This ataxia progresses and sooner or later involves the upper extremities, speech is affected and the increasing weakness finally brings the patient to bed for the rest of his life. The

mind is gradually affected and the patient lingers for years in a pathetic condition from which death is a grateful release.

Chondrodystrophia foetalis is what for some years Osler called "fetal rickets" though we know now that it has nothing in common with rickets. The pathological condition is almost entirely limited to the cartilaginous growth of the long bones. The arms and legs are affected, ossification taking place early so that these bones are greatly shortened. Most of these children die in infancy. The cases that live have characteristically large heads, due to a slight hydrocephalus, a trunk more or less normal with a prominent abdomen, and fat, and short arms and legs with peculiar, short fingers making the hand look like a trident, i.e., fingers fat and close together at the base and wide apart at the end. These cases comprise the majority of dwarfs seen in

FIG. 153.—Spastic paralysis.

our large cities. They are usually morons in intelligence but have happy and easily managed dispositions.

Osteogenesis Imperfecta. Pathologically this condition is just the opposite of chondrodystrophy. The shaft of the bone is soft and easily broken while the cartilaginous portion is not affected. This results in constant fracturing of the bones which leave marked deformities. A child may be born with fractures which have occurred in intrauterine life. The fractures take a somewhat longer time than normal to unite but they usually heal. The fragility of the bones vary in different cases so that the number of fractures also varies. The tendency to recovery varies also, some cases tend to get better slowly while others show no changes. There is no treatment, constant guarding from accident makes up the protective care of these cases.

Spastic Paralysis (Fig. 153). This type of paralysis is always cerebral in origin. It may be due to congenital defect in the brain but more often it is due to damage to the brain at

birth. This birth injury is usually connected with cerebral hemorrhages which may be very extensive or definitely localized. The symptoms are shown by a rigidity of the muscles so that voluntary use of the muscles is greatly inhibited. This muscular rigidity may be limited to one extremity or all extremities or may involve the whole body. Unfortunately, the minds of these children are generally affected as well as their general nutrition. The children who have mentality enough to get about may be seen hitching themselves along, under all sorts of jerky muscular movements of arms and body to propel themselves. The question of treatment in these cases is largely an orthopedic problem but the results depend largely upon the amount of intelligence the child possesses. The more severe cases are bedridden throughout life and such cases usually die early because they have less resistance.

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CHAPTER XV

COMMON SKIN CONDITIONS

ACCIDENTS

There are a few skin conditions in children which are not severe in themselves but, owing to the contagious nature of them and the ease with which they spread, it is important to know something about them and how to treat them.

Impetigo Contagiosa (Fig. 154). Every school nurse is familiar with this contagious skin disease which is usually found on the hands and face as small yellowish dry crusts. In the beginning, the lesions are vesicular, the vesicles containing a serous fluid which after breaking becomes pustular and as it dries forms these crusts. The condition is mildly contagious by direct contact. The child constantly re-infects himself and through handling books and playthings, and playing with other children, spreads the disease. Family, institution and school epidemics of the disease are common. Usually a child will have from six to a dozen lesions, but under bad hygienic conditions a child may be a mass of lesions.

The **diagnosis** is very simple and the treatment is equally simple. The crusts must be removed by softening them with hot water, or vaseline. After the removal of the crust, the area should be carefully washed with soap and water and then ammoniated mercury ointment applied. In infants and very young children, the official strength of the ointment may have to be weakened by one-half to one-quarter by adding vaseline. In some instances, after cleansing the area, it may be touched up with silver nitrate or copper sulphate. This condition is caused by skin cocci, a streptococcus of low virulency.

Furunculosis is also due to infection with these skin cocci infecting the hair follicles and causing suppuration. Often small furunculi or boils form in large numbers all over the child's body but particularly on the scalp and face. These boils have a tendency to appear in crops, as if there were definite periods of re-infection. This condition is often found in malnourished children though it sometimes appears in normal children.

Treatment of this condition is cleanliness, allowing the ripen-

ing and then opening of the furuncle, disinfecting the base and area around it with bichloride or with iodine, touching them with alcohol or with pure carbolic which must be followed by

FIG. 154.—Impetigo Contagiosa.

alcohol. In the majority of cases this treatment will be sufficient if care is taken to prevent re-infection of the child by himself. In the recurring chronic cases, an autogenous or stock vaccine may have to be given to raise the local immunity of the skin.

Scabies is another contagious skin disease often found in institutions and schools. The lesions are usually found on the hands and are burrows appearing as a slight darkish line about one-quarter of an inch long. In this burrow will be found the female acarus which causes the lesions. This acarus is carried in the finger nails and is introduced into the soft skin between the fingers, under the arms and between the legs by scratching. The earliest lesion after infection is a small vesicle which soon breaks and at times the lesions become mildly pustular. This is usually a filth disease most often seen in crowded districts of big cities where hygienic conditions are poor and malnutrition common. But the disease is no respecter of persons or class and contact with it will give it to anyone. The most characteristic symptoms is itching, which makes the diagnosis easy. The itching is increased by warmth which causes the scratching when a child is first put to bed. Scabies may always be cured with time and patience. A good routine is as follows: The child should have a hot bath to soften the burrows, then wash carefully with soap and water, using a nail brush over the burrows. This scrubbing must be thorough but it must be regulated by the quality of the skin. The body is then rubbed with a parasiticide ointment, particularly over the burrows. The baths and ointment treatment must be continued for three days and clean sheets and towels, and clean underclothes must be provided each day. The soiled sheets, towels and underclothes must be sterilized each day. Sulphur is the disinfectant most often used. This may be too irritating for delicate skins and a milder disinfectant such as balsam of Peru may have to be used. If there is much irritation, a soothing lotion or ointment such as calomine lotion or cream can be used.

Ringworm of the scalp. A parasite of the tinea family produces this condition. It is a fungus which penetrates into the hair follicles, destroying the root of the hair and forming a small pustule. Tinea circinata is a more superficial ringworm infection than the tinea tonsurans. They are both easy to determine by the circular scaly patch that is formed.

Treatment. These conditions are easy to cure if they are constantly observed over a long period. If the case is seen early before the fungus gets too deeply rooted, a cure may be accomplished in a few weeks. In chronic cases it may take a year or more to clear up the condition. The X-ray or radium in the hands of an expert is the most successful treatment. Locally the hair should be cut and the parasiticide ointment applied after the careful removal of all scales. As the hairs in the ringworm area loosen they should be picked out with small forceps and burned.

The hair should never be brushed as this spreads the disease. Various disinfectants have been used. I have had the best results with iodine, or with some mercury preparation. Caps and hats and hair ribbons, any articles that come in contact with the ringworm area, must be disinfected constantly.

Pediculosis of the scalp is caused by lice. It is another one of the filth diseases met in poorly conducted institutions and homes where lice are not thought of much importance. The result is that the condition is constantly met in large hospitals and the nurse must be on the watch for the nits in the hair which are the eggs of the lice and look like small, whitish grey specks near the roots of the hair. In cases of long standing the hair may be filled with nits as well as lice. The nurse must be careful in the care of these cases to avoid the condition for herself.

The treatment consists in soaking the head and hair in equal parts of cottonseed oil and kerosene oil or larkspur and ether two or three days in succession, after which the hair is carefully washed with carbolic soap and rinsed in warm vinegar which dissolves the nits. The hair should then be carefully combed with the finest of fine tooth combs. One treatment does not always cure the case for unless all the nits are removed there will be a recurrence of the condition.

Urticaria is a frequent disease, characterized by the sudden appearance of reddish blotches on the skin and equally sudden disappearance. These blotches may be papular or vesicular in type, and cause considerable itching. This condition is usually due to some digestive disturbance or to an acute susceptibility to certain proteins. The protein susceptibility may be tested by skin tests and where protein is the cause, urticaria falls into the same etiological grouping as the asthmas and the eczemas which are at times also due to protein anaphylaxis.

The treatment of the cases due to protein consists in regulating the diet to remove the offending protein, or desensitizing the child against the protein. When the cause is a digestive upset this must be treated primarily. The itching may be relieved by a weak soda solution, or a weak vinegar dilution, or witch hazel or Calomine cream. In severe cases a hypodermic injection of adrenalin may be given. Children subject to urticaria usually have delicate skins, and irritation from clothing must be avoided and overheating of the body guarded against.

In the care of all these skin affections so common in childhood because of the natural intimacy in contact of all children, the quality of the child's skin must determine the methods used

for the cleansing of the parts affected or of the whole body. These conditions are all caused by skin irritants and some skins are irritated by too much soap and water just as others are by dirt, and in cleaning up any of these conditions care should be taken not to scrub some new irritation into action in our anxiety to scrub out the old one.

Accidents

Burns are one of the most common accidents of childhood. Slight burns on fingers and hands are painful to the child at the moment but usually subside with the application of soda solutions and wrapping up to keep the air from the burn. Severe burning of a child over large areas of the body presents a big nursing problem, as the shock to the child's nervous system is very great, and often the effort to discover the extent and depth of the burns leaves a child in a state of dangerous exhaustion. Such severe burns often mean a long period of care which may have to include skin grafting and other surgical measures that are a drain upon the child's vitality. The whole general condition of the child must be observed carefully under these conditions and the diet and hygiene most skillfully regulated to keep the child up to par.

If the burn is deep and covers a surface equal to one-fourth or more of the trunk, the child is likely to die from shock or from the toxic changes produced by the burned tissue. Later death may be caused from sepsis, the introduction of tetanus germs or erysipelas. On account of the tenderness and delicacy of children's skin, large areas are liable to slough even from less severe burns.

In the treatment, relief of shock is the first step; then to lessen the pain and exclude the air from the burned tissues, and to as far as possible maintain an aseptic condition. For shock, quick stimulants such as aromatic spirits of ammonia or whiskey may be given by mouth, rectally or hypodermically. For the pain, as well as the shock morphine is often valuable. In extensive burns it may be necessary to give ether anesthetic while the clothes are cut way and the burn dressed. This is far more humane and a safer way to getting the area cleaned, which is an all-important measure, as temporizing methods relieve pain but cover up infected areas that should have been cleaned out. The dressings may be of warm saturated soda bicarbonate or the child may be put into a bath of the same, or of normal salt solution, or 4 per cent boracic acid. The dressings may be kept moist with any of these solutions. Picric acid one-half per cent

solution often gives relief to pain in first degree burns. The old-fashioned Carron oil or some ointment as vaseline or boric may be spread over to exclude air. In removing the dressings, diluted peroxide of hydrogen will assist in loosening the dressings. Transfusion, after removal of as much blood as can be safely withdrawn, is of value in severe toxic cases.

Throughout the whole procedure, the general temperature of the child should be carefully watched, and if necessary external heat must be applied. The prolonged treatment of dressings, skin grafts and the prevention of contractions are exclusively surgical problems.

Frostbites and Chilblains. Frostbites are produced by the constriction of the peripheral vessels by cold. The hands, feet and ears are the parts most often affected. In the treatment, the most important point to remember is that the circulation must be allowed to return slowly. For this reason, the application of snow or cold water to stimulate the circulation should be done very gradually. The parts may be stimulated by rubbing gently with camphor water or alcohol. If blistering occurs or the tissue is broken down, the latter treatment is the same as for burns.

Chilblains are not uncommon in debilitated children and are due to the sudden warming of cold extremities. The main symptoms are intensive burning and itching. This may be treated by applying powders such as aristol powder or stearate of zinc powder, or by using a carbolized vaseline. Many remedies for chilblains have been suggested and are effective in so far as they stop the burning and itching.

Nose Bleed (Epistaxis). This conditions is common in childhood. Nose bleed if slight can be checked by applying ice to the nose or to the back of the neck. Sometimes having the child lean forward and holding the nostrils together, forcing the child to breathe through his mouth, allows a clot to form. This may take at least five minutes to accomplish and with a little frightened child it is difficult. With older children it may be quite effective. Certain astringents, such as vinegar, solution of alum or adrenalin, may be applied by gently swabbing the nasal passages. Where the hemorrhage continues for any length of time, the nasal passages must be plugged with cotton pledgets rolled to about the size of the nasal cavity. These may be soaked in vinegar, alum or adrenalin. They should be attached to a string so that they may be easily removed. In cases where the hemorrhage is from the posterior nasal cavity such plugging is not usually effective. In these cases a soft catheter threaded with a double coarse thread may be carried through the nose into

the pharynx where the thread is caught by forceps and one end drawn out through the mouth. One of these thread ends may be attached to a cotton pledget soaked in alum or adrenalin and then drawn back through the pharynx into the posterior nares. The other end of the thread is attached to the corner of the mouth.

Foreign Bodies in the Nose. Children are apt in their play or in their adventurous spirit to experiment to put all sorts of small objects up their noses. If simply blowing of the nose does not dislodge the foreign body, making the child sneeze will sometimes accomplish it. Sneezing may be induced by tickling the other nostril, or by smelling pepper or snuff. Irrigating the nose by introducing a catheter in the free nostril while the head is held forward, may help to loosen the body. If these simple methods fail, then a doctor will have to use a nasal speculum and remove the object with forceps. This may have to be done under local or general anesthesia. The danger from foreign bodies remaining in the nasal cavities is the causing of an ulceration with a purulent offensive odor. Sometimes the foreign body is not detected until a child is brought to the clinic or doctor for this discharge.

Foreign Bodies in the Ear. Children are also apt to put small objects into their own ears or the ears of their friends, or insects are likely to get into the ear cavity. The simplest method of removal is to bend the child's head over to one side and gently tap the skull in front of the ear. If an insect has become lodged in the ear, pouring glycerine or oil into the ear will kill the insect and then it may be removed by irrigation. Other foreign bodies if not too tightly wedged will yield to the same treatment. If none of these methods accomplish results, it is then a matter of surgical procedure under anesthetic and great care must be taken to avoid injury to the ear drums.

Foreign Bodies in the Air Passages. A much more serious accident in childhood is getting foreign bodies into the larynx. Sometimes in young infants the diagnosis of this is very difficult and the symptoms will often resemble an acute laryngitis or even whooping cough. In older children the symptoms are fairly marked. There is difficulty in breathing, often alarming signs of suffocation, and immediate action must be taken. Inversion of the child and patting him on the back will often immediately dislodge the foreign body and this is the usual first method. If this fails, there is little time to seek the necessary surgical relief.

Tracheotomy may have to be performed if there is time. But in hospitals we more often meet the imbedded small object in

the right bronchus. The removal of such objects are among the most difficult of surgical operations and the nursing care of these children must always consider the possibility of pneumonia and avoid that if possible.

Foreign Bodies in the Eye. There is nothing more painful for child or adult than the lodgment of a foreign body in the eye. The eye responds very rapidly with an acute inflammation which makes the removal of the object more difficult but imperative. The usual small speck may be easily removed if it is attended to immediately by wiping it off the eye ball or lid with a cotton pledget or the corner of a soft clean handkerchief. The eyelids may be gently rolled back. If inflammation has already begun, the object may be removed by gently irrigating the eye with warm boracic acid solution. The eye may have to be desensitized with cocain or one of the allied group of drugs to stop the pain and allow the object to be removed by a surgeon. Immediate action is essential.

Bruises, Sprains and Fractures. The usual bruises of childhood are bumped heads from falling or striking the head against some sharp corner of a piece of furniture, etc., and these bruises may be simple, causing a swelling and then discoloration when the bruise is healing. Cold compresses and quiet are the best treatment for these simple bruises. If the bruise is severe, causing large or deep bleeding wounds, the procedure is surgical, and until that care is secured the usual methods of stopping the bleeding should be carried on and a sterile dressing placed temporarily over the wound until a surgeon arrives.

Simple cuts need the usual surgical cleanliness in order to avoid infection—washing the cuts with warm boiled water and antiseptic solution and wrapping them in sterile dressings, bringing the straight or ragged edges of the cut gently together in bandaging. The healthy child usually needs but the one dressing of a cut if all dirt is removed and the wound is perfectly clean before bandaging. If that is not accomplished in the beginning, pain and swelling will result from the slightest infection of the cut, and the wound will have to be opened and cleaned and a fresh start in healing made. In severe wounds on the child's head, especially the forehead, great skill and care is essential in cleaning and handling the wound to avoid as much scarring as possible. If stitching is necessary, many surgeons prefer to wait a number of hours before doing it in order to allow the swelling to subside.

Sprains. In children both wrists and ankles are the common seat of sprains, and for the simple sprains the application for an hour or more of very hot water, followed by an adhesive plaster

strapping of the joint involved will be all that is needed. If the sprain is deep, involving badly stretched or torn ligaments and tendons, it is of course the problem of a surgeon, and the child should be kept quiet until such care can be given.

Fractures. Sprains often are complicated with slight fractures which are not recognized in simple home treatment. It is always safer when there has been a sprain involving any joint for a very complete examination to be made, under anesthetic if necessary, and repeated X-ray pictures made. The fracture of the clavicle is the most frequent fracture of childhood, and is perhaps the most often overlooked of all fractures. The child may have a tumble that "didn't hurt" and later the nurse may

Fig. 155.—Greenstick fracture of radius and ulna.

notice that the child is avoiding the use of his hand or forearm and is peevish and full of tears.

The clavicle fracture and the greenstick fracture (Fig. 155) are easily overlooked in infants and young children. The nursing care of all these surgical conditions in childhood demands constant watching. Children are not to be trusted when up and on crutches to go without observation. The treatment of fractures being a surgical care, the only aspect stressed here is the immediate care and supervision.

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CHAPTER XVI

DRUGS

Drug therapy in the diseases of infancy and childhood is less important as an element of treatment than it was a generation ago. Dr. Abraham Jacobi has well said that "Most conditions in childhood right themselves without any medication."

Certain diseases, however, demand medication and physicians do order drugs of various kinds for almost every disease to which the flesh is heir, and the nurse has the very important duty of administration. Intelligence and accuracy are essential to the proper giving of medicine and the nurse must know more than the legend on the label of the bottle. She should know the reason the particular medicine is given, the results desired, as well as possible developments which are likely to follow certain dosages. Except in emergencies a nurse should never administer a drug without the written order of the physician.

Rules for calculating dosages of medicine for different ages are not very reliable though they are practically all we have at present. One such rule is Young's which is

$$\text{Adult's dose} = X\,\frac{\text{Age}}{\text{Age } 12}$$

which gives the fraction of the adult dose proper for the particular child. Other rules are based on weight or a combination of weight and age. These rules, however, solve the problem very inadequately. The child may be a miniature adult but drugs cannot be administered in this ratio. As Helmholz suggests (Helmholz, Henry: The Use of Drugs in Infancy and Childhood, J. A. M. A., 77:1157) the proportion of various organs to the infant's or child's body weight changes as the child develops, a very important point in drug therapy.

"A number of drugs do not distribute themselves equally over the body, but have certain affinities for various tissues and constituents of tissue."

Children as well as adults have individual idiosyncrasies or susceptibilities to different drugs and these should be guarded against. For example, children are more susceptible to opium

and its derivatives than adults and a relatively smaller amount should be given them. Drugs, injudiciously given, complicate gastro-intestinal disturbances and occasionally have been known to cause them. Drugs (alcohol, chloral, salicylates, etc.) which are known to have an irritating effect on the alimentary tract, should be given very cautiously. It is also well to remember that certain drugs have a therapeutic limit beyond which they cannot be pushed with safety. All drugs known and labeled as "Poisons" belong to this group. Each drug manifests this limit by certain clinical signs peculiar to itself. The important drugs of this class commonly used in childhood are arsenic (Fowler's solution), belladonna (atropin), digitalis, opium (and its derivatives), strychnin (nux vomica), and thyroid extract. Signs of excessive dosage of these drugs are the same in childhood as in adult life.

Medicines may be administered by various channels, by mouth, by rectum, by inunction, subcutaneously, intramuscularly, intravenously, by inhalation, and by proctoclysis. These routes are chosen according to the effect and rapidity of the reaction desired as well as to the nature of the drug and the condition of the child. Certain drugs, such as the specific sera, are always given intravenously or subcutaneously, never by mouth.

The most important group of drugs are the stimulants, which are used either for general results, or for direct cardiac or respiratory effects. The diffusable general stimulants are camphor, the alcoholic group of whiskey or brandy, aromatic spirits of ammonia. When rapid action is desired these drugs are given hypodermically, either into the muscle which gives quicker results, or into the subcutaneous tissue. These drugs are rarely given intravenously.

Digitalis is the most important cardiac stimulant. It increases the force of the heart beat by lengthening and slowing the heart action. If the blood pressure is low, it tends to raise it. In the presence of ascites or edema, digitalis increases the action of the kidney (diuresis). Most of the preparations of digitalis are slow in action, taking from twenty-four to forty-eight hours before results can be expected when the tincture of digitalis is used. If more rapid results are desired, one of the more active digitalis group, strophanthin or digipuratum, may be given intramuscularly or intravenously. These injections should be given slowly and the effects may be expected in a half hour after the intramuscular injection, and in ten minutes after the intravenous injection.

Another group of stimulants which have more of a central nervous system action are strychnine and caffeine. Caffeine is probably more often used than strychnine. These two drugs

may be given by mouth or subcutaneously. Care must be taken that these drugs do not increase the nervousness or produce restlessness. Their effect may be expected in a half an hour to an hour according to the size of the dose given. In older children, black coffee is sometimes used as a quick stimulant, the heat as well as the caffeine helping.

The hypnotic or sedative drugs are indicated in many conditions where calming and quieting a child is of importance. *Morphine* diminishes sensibility to pain rapidly and cuts out external impressions and stimuli. It slows the respiration and the heart action and for this reason may be indicated in cardiac conditions where there is restlessness and pain. In this way morphine is more valuable sometimes than a stimulant and really strengthens the heart by giving it rest. Morphine diminishes the general metabolism of the whole body; stops or diminishes peristalsis, colic or intestinal spasm. When giving morphine the toxic effects should be carefully watched for. One of the most serious toxic effects is the coming of stupor with slow, shallow, irregular respirations. The greatest danger is the depression of the respiratory center and this may cause death. During the administration of morphine the pupils become contracted or "pin point" and the face may become cyanotic or flushed. Vomiting or nausea may be produced. Morphine may be given by mouth or subcutaneously. *Atropin* is often given with morphine because it lessens the possibility of the toxic symptoms and the chances of nausea. Atropin itself dries up the secretions and acts as an antidote to morphine.

Opium is also used quite extensively in the form of paregoric, or the much stronger tinctura opii deodorati preparation of opium is occasionally used. Both these forms are more often used in gastro-intestinal conditions than in any other. The effect of these forms of opium is fairly rapid, depending upon the dose. As a respiratory sedative, *codeine* is extensively used, and is given as codeine sulphate subcutaneously, when its action may be expected in a half an hour, or it may be given by mouth in combination with various other drugs such as terpine hydrate.

Mercury has many uses in pediatric practice. It is used as an anti-syphilitic when it can be given by mouth, hypodermically or in the form of inunctions. Mercury may be used as a disinfectant, i. e., bichloride of mercury or corrosive sublimate. It is also used in ointment form as a local irritant and antiseptic for local infections such as impetigo when ammoniated mercury is used. Mercury as an anti-syphilitic is often used in combination with salvarsan or neosalvarsan. Salvarsan and neosalvarsan

are synthetic arsenical preparations which have apparently a specific pathogenicity for the spirochete.

Arsenic. Arsenic in the form of Fowler's solution is commonly used for chorea in rapidly increasing doses. It is also used as a tonic to improve nutritional conditions and in certain anemic conditions is used in conjunction with iron. The method of administering Fowler's solution is to begin with a small dose and gradually increase it until the tolerance for the drug has been determined. The tolerance is shown by diarrhea or vomiting, or by slight puffiness under the eyelids. As soon as any one of these symptoms appear the drug must be stopped or very markedly diminished.

The following drugs will be found the more common ones used in the practice of pediatrics:

	Dose			
	6 months	18 months	3 years	5 years
Acid, Salicylic:				
This is used in the form of sodium salicylate or aspirin	1 gr.	½ gr.	2–3 gr.	3–5 gr.
Aconite:				
Tincture of aconite root (10 per cent) used in the beginning of fevers as a circulatory sedative and an analgrsic	¼ drop	½ drop	1 drop	1½ drop
Aromatic Spirits of Ammonia:				
Best given well diluted with water	3 drops	3–5 drops	5 drops	5–10 drops
Antipyrin:				
Best given in powder form or with sodium bromidin solution	½ gr.	1–1½ gr.	2 gr.	3 gr.
Arsenic:				
Given in the form of Fowler's solution. It is best given in water. It is usually given in increasing doses, beginning with the minimum and working up to the maximum	½ drop	1 drop	2 drops	2–5 drops
Atropin:				
Used as respiratory stimulant also sometimes used for the cure of enuresis or in spasmophilic conditions	1/500 gr.	1/300 gr.	1/250 gr.	1/200 gr.
Belladonna:				
Tincture of belladonna (10 per cent leaves)	¼–½ drop	1 drop	1–2 drops	3–5 drops
Sodium Bromid	1–3 gr.	2–4 gr.	3–5 gr.	5–8 gr.
Codein (Methylmorphin as sulphate or phosphate	....	1/20 gr.	1/10	1/8
Caffein	½ gr.	½–1 gr.	1–1½ gr.	1½–2 gr.
Calcium:				
Calcium lactate	5 gr.	10 gr.	20 gr.	20 gr.
(Compound chalk mixture. Mistura cretae composita). Often used as a 20 per cent chalk mixture and 40 per cent cinnamon water	1 teasp.	1 teasp.	1½ teasp.	2 teasp.
Camphor:				
Spirits of camphor (10 per cent in alcohol). General stimulant, usually given hypodermically	3 drops	5 drops	5–10 drops	10 drops

	Dose			
	6 months	18 months	3 years	5 years
Castor Oil:				
Oleum ricini	1 teasp.	2 teasp.	3 teasp.	4 teasp.
Chloral Hydrate:				
Sedative	....	1 gr.	1½ gr.	2 gr.
Cod-liver Oil	10–15 drops	10–20 drops	20–30 drops	½–1 teasp.
Digitalis:				
Tincture of digitalis (10 per cent leaves)	½ drop	1 drop	1–2 drops	2–3 drops
Digitalin	1/200 gr.	1/200 gr.	1/150 gr.	1/100 gr.
Ipecac:				
Syrup of ipecac	½–1 drop	1–2 drop	3 drops	3–5 drops
Strophanthus:				
Tincture of strophanthus (11 per cent in New Pharmacopeia, or twice former strength). Cardiac tonic and diuretic. Preferred to digitalis in the treatment of children because better borne	1 drop	1–2 drops	2 drops	2–3 drops
Iron:				
Syrup of the iodid of iron (5 per cent ferrous iodid)	3 drops	6 drops	10 drops	20–30 drops
Or as Blaud's pills, 1–5 gr.	....	....	....	....
Citrate of iron, 1–3 gr. given hypodermically	....	....	....	....
Mercury:				
Mercury with chalk (Gray powder) (38 per cent mercury) given in divided doses from 1–2 gr.	....	....	....	....
Mild chloride of mercury (Calomel)	....	....	....	....
Cathartic, antisyphilitic	....	....	....	....
At thirty-minute intervals	....	....	....	....
At one hour intervals	....	....	....	....
Rarely necessary to give more than one grain for laxative effect	1/10 gr.	1/6 gr.	¼ gr.	¼ gr.
Nux Vomica:				
Tincture of nux vomica (1 per cent strychnin)	½ drop	1 drop	1–2 drops	2–4 drops
Strychnin General Stimulant	1/400–1/200 gr.	1/150 gr.	1/100 gr.	1/100 gr.
Opium:				
Tincture of deodorized opium (10 per cent) used in 3 to 10 drops doses in enemata as a sedative for children under 5 years of age	....	....	....	....
Camphorated tincture of opium paregoric—0.4 per cent opium	3–5 drops	10 drops	15–20 drops	20–30 drops
Powder of ipecac and opium (Dovers powder 10 per cent each of ipecac and opium)	⅛–¼ gr.	½–¾ gr.	1–1½ gr.	2–3 gr.
Morphin:				
Not well borne by children and best given hypodermically	1/100 gr.	1/100 gr.	1/50 gr.	1/20 gr.
Peppermint:				
Aqua mentha piperitae	....	....	....	....
Peppermint water (used as a vehicle 1–4 teaspoon	....	....	....	....
Quinin:				
¼ gr.	1 gr.	1–2 gr.	2–3 gr.	3–4 gr.
Rhubarb:				
Rhubarb powder, as a laxative. Aromatic syrup of rhubarb often used as a laxative or flavoring. Medium. Mixture of rhubarb and soda corrective and laxative	1–2 gr.	2–3 gr.	3–4 gr.	5 gr.
½–4 teaspoonsfuls 1–3 times a day	1 teasp.	2 teasp.	3 teasp.	4 teasp.

Common Poisons Which Children May Inadvertently Get Hold of and Their Antidotes

Arsenic is present in rat poisons, vermin destroyers, Paris green and Fowler's solution. The *symptoms* are severe pain in the stomach, diarrhea, cramps in legs, vomiting, cold sweat and prostration. The following emetics should be given; drinking of much lukewarm water; magnesia in large quantities, baking soda or water of ammonia; followed with whites of raw eggs, milk or sweet oil. Castor oil should be given to open the bowels. Soap and water enema and warmth and rubbing are of assistance.

Opium is present in laudanum, paregoric; certain syrups and in cough mixtures. The *symptoms* of opium poisoning are drowsiness, unconsciousness; a strong pulse at first, becoming weaker later, the breathing is deep and slow, becoming more and more slow and shallow; the pupils of the eyes are very small and the face is flushed and later turns bluish. An emetic should be given to produce vomiting. This is often difficult to bring about but should be persisted in until the desired results are obtained. Strong coffee is useful. Keep the patient awake by speaking loudly to him but do not tire out by walking. Stimulants should be given and artificial respiration resorted to.

Prosphorus can be obtained in match-heads, rat poisons and vermin destroyers. The *symptoms* are severe pains in the stomach, vomiting, bloody diarrhea, dark skin, nosebleed, possibly convulsions. An emetic should be given followed with epsom salts, tablespoonful in a glass of water; or magnesia. Milk can be given but no oils of any kind. Stimulants and warmth are essential.

Lead is present in lead paint, sugar of lead and white lead. The symptoms are a metallic taste, dry throat, thirst; colic in abdomen, cold sweat, cramps in legs and the legs are sometimes paralyzed. There may be convulsions. A heaping tablespoonful of epsom salts in a glass of water, stimulants and soothing liquids should be given.

Ptomaine poisoning is caused by decayed meat, fish, dirty milk, ice-cream and decayed vegetables. The *symptoms* are nausea, vomiting, diarrhea, cold sweat; a weak pulse, severe colic and cramps; extreme prostration and skin rashes are common. As a purgative, epsom salts or castor oil should be given and a teaspoonful of powdered charcoal given at repeated intervals.

Mercury is present in corrosive sublimate and antiseptic tablets. *Symptoms:* When taken, it turns the mouth, lips and

tongue white. The mouth is swollen, the tongue shrivelled and there is a metallic taste. There is pain in the abdomen; vomiting of mucus and blood; a bloody diarrhea; a cold, wet skin; prostration and convulsions. An emetic should be given followed with soothing liquids and stimulants.

Iodine. The *symptoms* of iodine poisoning are metallic taste in the mouth, marked prostration, severe pain in the stomach and abdomen, violent vomiting and diarrhea. Large amounts of starch or flour mixed with water should be given followed with emetics, milk, and raw whites of eggs should be administered and warmth applied to the extremities and body.

Nitrate of silver is present in lunar and caustic sticks. The symptoms are pain in the mouth and stomach. The mouth appears white, then black and the patient vomits first white and then black. A teaspoonful of table-salt dissolved in a glass of water and milk, followed by an emetic should be given. Soothing liquids and stimulants should also be given.

Poisons for Which an Emetic Should Never Be Given

The strong corrosive acids are present in acetic, hydrochloric, nitric and sulphuric (vitriol). The *symptoms* are severe burning pain in mouth, throat and stomach. The acid destroys the membrane and skin. Vomiting, diarrhea, suffocation from swelling of the throat and prostration are present. Magnesia or chalk in water and large amounts of baking soda, lime, whiting, and even toothpowder may be used as alkali to neutralize the acid. This should be followed with soothing liquids, milk, raw eggs, olive or sweet oil.

Oxalic acid is present in salts of lemon or sorrel. The symptoms are similar to the corrosive acids named above, but there is not so much burning of the lips, etc. Magnesia, chalk and water, or lime water to neutralize the acid should be used, followed with two tablespoonsful of castor oil and stimulants.

Carbolic acid may be found in creosote. The symptoms are severe pain and vomiting. In severe cases, the patient is unconscious, there is a characteristic odor of acid and if the acid is pure, the membrane turns white, if impure, the membrane turns black. The mouth should be washed out with lime water. Pure alcohol or two tablespoonfuls of epsom salts in a half glass of water should be given. Raw eggs, castor or sweet oil should be given. Stimulants are helpful and the body should be kept warm.

Strong caustic alkalies are present in ammonia, quick lime or lye, caustic potash, caustic soda. The symptoms are severe

burning pain in the mouth, throat and stomach; vomiting and diarrhea and the alkali is destructive to the tissues of the mouth. There is severe prostration and suffocation due to swelling of the throat. To neutralize the alkali, vinegar, lemon juice, and orange juice should be given, also tartaric or citric acid in an abundance of water, soothing liquids and stimulants. If unable to swallow, the patient should inhale the vinegar from the handkerchief.

Gas (illuminating or coal gas). Treatment consists mostly of artificial respiration as in drowning. Ammonia can be applied to the nostrils.

GLOSSARY

The following glossary contains technical words which the nurse will probably not have met in previous courses and lectures. The definitions are practically those given by:

DORLAND, W. A. Newman, American Illustrated Medical Dictionary. W. B. Saunders Co., Philadelphia, 1921, or

STEDMAN, Thomas Lathrop, A Practical Medical Dictionary. William Wood & Co., New York, 1922.

Atresia: Congenital absence or pathological closure of a normal opening or passage.

Anencephalus: A monster without a brain.

Acrania: Congenital absence of most or all of the bones of the cranium.

Alveoli: Air cells, terminal dilatations of the bronchioles in the lungs.

Amino Acids: A compound characterized by possessing the acid radical COOH and the amino radical NH_2. The amino acids are regarded as the building stones of the protein molecule.

Antiscorbutic: A remedy for scurvy; preventive or curative of scorbutus or scurvy.

Aplasia: Congenital absence of an organ or other part.

Bulla (pl. bullae): Bleb, blister; a circumscribed area of separation of the epidermis, due to the presence of a clear non-purulent fluid.

Bilirubin: A red bile pigment, the coloring matter of stools and sometimes found in the urine. It is crystalline in form and is insoluble in water, nearly so in alcohol, but quite soluble in alkaline solutions.

Biliverdin: A green pigment formed from bilirubin by oxidation, which gives the green color to stools. It occurs in gallstones and in the urine in jaundice.

Corpus Callosum: The callosum, or great commissure of the brain; it is an arched mass of white matter, situated at the bottom of the longitudinal fissure, and is made up of transverse fibers connecting the cerebral hemispheres.

Corpus Luteum: "Yellow body," a yellow mass in the ovary in the place of an ovisac which has discharged its ovum; if the ovum has been impregnated, the corpus luteum grows and lasts for several months; if impregnation has not taken place, the corpus luteum degenerates and shrinks.

Colloid (Colloidal): Glutinous or resembling glue. (2) Any non-crystalloid substance; any substances whose hydrates are gelatinous. The colloids are slowly diffusible rather than soluble in water and do not pass through animal membranes. (3) The translucent, yellowish, gelatinous substance resulting from colloid degeneration.

Cremasteric: Pertaining to the cremaster: the muscle at the crest of the public bone and sheath of rectus abdominis, which retracts the testicle.

Cytology: The scientific study of cells, their structure and functions.

Diaphoresis: Perspiration and especially profuse perspiration.

Diplopia: The seeing of single objects as double or two.

Diuretics: (1) Increasing the secretion of urine. (2) A medicine that promotes the secretion of urine.

Dystrophy: (Dystrophia) Defective or faulty nutrition, e.g., progressive muscular dystrophy: progressive atrophy of the muscles with no discoverable lesion of the spinal cord.

Ecchymoses: An extravasation of blood; also a discoloration of the skin caused by the extravasation of blood.

Endoscope: An instrument for the examination of the interior of a hollow viscus, such as the bladder.

Enzymes: A chemic or non-organized ferment formed within the body. Enzymes are complex organic chemic compounds capable of producing, by catalytic action, the transformation, of some other compound or compounds.

Epinephrin: The active principle of the medulla of the adrenal bodies (suprarenal capsules) whose specific action on the system is to slow the heart-rate and increase the blood-pressure. It also increases the output of sugar in the urine. It is employed in medicine as an astringent and hemostatic and an adjuvant in local anaesthesia. In pure form it is a crystalline powder.

Erepsin: A ferment of the intestinal mucous membrans which breaks up peptones and deutero-albumins, but has no effect on unaltered albumin.

Fehling's Test: (Fehling's solution) An aqueous solution of cupric sulphate mixed with potassium hydroxid solutions: used in testing for sugar.

Fremitus: A thrill or vibration, especially one that is perceptible on palpation.

Glioma: Malignant sarcoma of a structure resembling neuroglia (Virchow). It occurs only in nervous tissue, and consists of a homogenous matrix containing numerous granular nucleated cells.

Gliosarcoma: A sarcoma containing glia cells.

Glomerular: Pertaining to or of the nature of a glomerulus (a tuft or cluster; a coil of blood-vessels projecting into the expanded end or capsule of each of the uriniferous tabules).

Hemolysis: The dissolution of the red blood-corpuscles by the action of specific lysins or hemolysins, by certain chemicals, by freezing or heating, or by the action of distilled water.

Histamin: An amino acid.

Hydrobilirubin: A brownish-red pigment, derivable from bilirubin by the addition of hydrogen and oxygen.

Hypospadias: The congenital opening of the urethra on the under side of the penis; also an opening of the urethra into the vagina.

Insufflation: The act of blowing a powder, vapor, glass or air into a cavity, as into the lungs.

"Invertin": A ferment produced by various yeast-plants which converts cane sugar into invert sugar. It is found in the intestinal juice.

Kumyss: (also koumiss) A fermented alcoholic drink prepared from cow's milk; originally from mare's milk.

Lordosis: Curvature of the spinal column with a forward convexity.

Nystagmus: A continuous rolling movement of the eyeball; lateral: movement from side to side; rotary: circular movement; vertical: movement up and down.

Oliguria: (or oliguresis) Deficient secretion of the urine; abnormally diminished frequency of micturition.

Organic Radicals: Organic: arising from an organism or pertaining to substances derived from living organisms; radicals: a group of atoms which enters into and goes out of chemical combination without change, and which forms one of the fundamental constituents of a molecule.

Orthopnea: Inability to breathe except in an upright position.

Osmotic Pressure: The pressure which brings about diffusion between solutions of different concentration or between a solute and the fluid in which it is dissolved.

Parenteral: Not through the alimentary canal, i.e., either subcutaneous or intravenous or congenital (as syphilis).

Pathognomonic: Pointing out the nature of a disease or illness.

Phimosis: Tightness of the foreskin, so that it cannot be drawn back from over the glans; also the analogous condition in the clitorus.

Polyneuritic: Pertaining to inflammation of many nerves at once; multiple neuritis.

Ptosis: The prolapse of an organ or part. (2) The paralytic drooping of the eyelid.

Strabismus: A squint; deviation of one of the eyes from its proper direction, so that the visual axes cannot both be directed simultaneously at the same objective point.

Syndrome: A complex of symptoms; a set of symptoms which occur together; the sum of signs of any morbid state.

Synovitis: Inflammation of a synovial membrane. It is usually painful, particularly on motion, and is characterized by a fluctuating swelling, due to effusion within a synovial sac. It may be caused by septic poisoning, an exanthematous disease, tuberculosis, syphilis, rheumatism or other causes. It is treated by rest and counter-irritation, and sometimes by drainage or aspiration.

Tentorium: The process of dura mater forming a partition between the cerebrum and cerebellum, and covering the upper surface of the cerebellum.

INDEX